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USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM (1982)
MANAGEMENT REPORT(U) SOUTHEASTERN CENTER FOR ELECTRICAL
ENGINEERING EDUCATION INC S. W D PEELE ET AL. OCT 82

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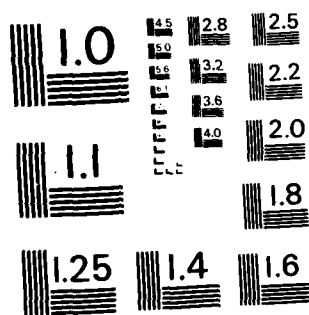
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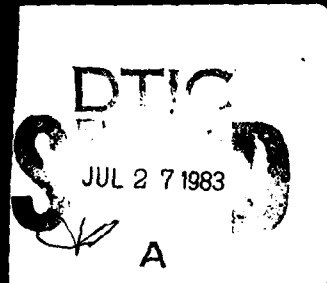
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1982 USAF/SCEEE SUMMER FACULTY
RESEARCH PROGRAM

Conducted by
Southeastern Center for
Electrical Engineering Education
under
USAF Contract Number F49620-82-C-0035

MANAGEMENT REPORT

Submitted to
Air Force Office of Scientific Research
Bolling Air Force Base
Washington D.C.

by
Southeastern Center for
Electrical Engineering Education

October 1982

JUL 27 1983

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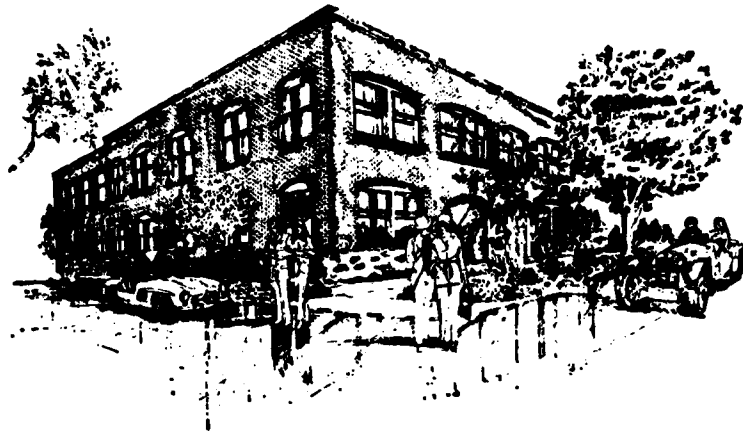
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UNITED STATES AIR FORCE
SUMMER FACULTY RESEARCH PROGRAM

1982

PROGRAM MANAGEMENT

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION



SCREE
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1981

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I. Introduction and History

The United States Air Force Summer Faculty Research Program (USAF-SFRP) Contract was awarded to the Southeastern Center for Electrical Engineering Education on December 14, 1981. The contract is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force and is conducted by SCEEE.

The program provides opportunities for research in the physical sciences, engineering, life sciences, business, and administrative sciences. The program has been effective in providing basic research opportunities to the faculty of universities, colleges, and technical institutions throughout the United States.

The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs. Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program has been judged highly successful and is being expanded for the 1983 program.

Follow-on research opportunities have been developed for a large percentage of the participants in the Summer Faculty Research Program in the 1979 - 1982 period.

II. Recruiting and Selection

The program is conducted on a nationally advertised and competitive selection basis. Advertising for the 1982 program was conducted via direct mail to all accredited engineering departments and schools; and all departments of chemistry, physics, mathematics, and computer science. Information on the SFRP was mailed to over 500 department chairmen; brochures were made available to all participating USAF Laboratories/Centers; distribution was made through AFROIC units on university campuses; information was supplied to all who made requests. Overall over 6000 brochures were distributed throughout the country.

In the 1979 program, 70 faculty members participated. In the 1980 and 1981 program, 87 faculty members participated each year, 91 faculty and 17 students participated in the 1982 program. There were approximately 5 applicants for each available faculty position.

Applications were due at SCEEE on or before February 1, 1982. The selection panel convened in February and announcements of selections were made before March 1, 1982.

III. Graduate Student Summer Support Program (GSSSP)

A pilot program for Graduate Student Summer Support via the AFOSR Summer Faculty Research Program (SFRP) was initiated by contract modification on 26 March 1982. The program was developed as an adjunct effort to the SFRP. Its purpose is to provide funds for selected graduate students to work at an appropriate Air Force Laboratory or Center with a supervising professor who holds a concurrent SFRP appointment. Although only 16 positions were budgeted, SCEE appointed 17 graduate students representing twelve (15) schools and ten (10) disciplines in science and engineering.

The 1982 GSSSP Program Report is published as a separate document of the 1982 SFRP Program and is entitled, Graduate Student Summer Support Program, SCEE Press, October 1982.

IV. Air Force Geophysics Scholar Program

On 1 June 1982 SCEE and AFOSR initiated an Air Force Geophysics Scholar Program (AFGSP) via modification to the current SFRP Contract. The AFGSP is an extension of the SFRP concept which includes emerging post doctoral researchers for up to full year on-site programs at the Air Force Geophysics Laboratory.

The AFGSP was initiated on 1 June 1982 with an Application deadline of 1 August 1982. Advertising time was limited to two months for preparation and distribution of materials. This limited advertising produced twice as many highly qualified applicants as there were positions available (19:10), a ratio which provides adequate alternates with a minimal negative impact on unsuccessful applicants. All positions are presently filled. The details of the program will be published in the 1983 SFRP report, after the first year of the program has been completed.

V. Historically Black College (HBC) Workshops

As part of its Affirmative Action Program SCEE proposed several HBC Workshops during the 1981-1982 Academic Year in order to increase the participation of HBC Faculty in the SFRP Program. In view of the late Contract Award date of December 14, 1981, the HBC Workshops have been Contractually delayed until Fall and Winter of 1982 in order to maximize their effectiveness on the 1983 Program

VI. Site Visits

6-7 July 1982

Visits To: AMRL, AFWAL Labs, HRL, BRMC -
Wright-Patterson AFB, OH

8 July 1982

Visits To: Armament Division (AFATL), - Eglin AFB, FL

9 July 1982

Visits To: Engineering Services Center - Tyndall AFB, FL

16 July 1982

Visits To: RADC, - Griffiss AFB, NY

26 July 1982

Visits To: HRL/Lowry; FJSRL, USAFA, Rocket Lab, -
Edwards AFB, CA

27 July 1982

Visits To: AFWL - Kirtland AFB, NM

28 July 1982

Visits To: USAFSAM, HRL - Brooks AFB, TX

The visits were made on an unannounced basis at the request of AFOSR. Visits listed include those by SCEEE and AFOSR Personnel. The faculty are generally satisfied with the mechanics of the program. All faculty, USAF Research Colleagues, and students applaud the GSSSP initiative. Criticisms were: short notice of program initiation; advance pay is needed; housing for researchers with families is hard to find; better clerical support needed on site; on-campus support for students is desirable.

We find that the objectives of the SFRP are being well served. SFRP Research Fellows indicate that they are performing independent research, and are not being used as "summer help". There are some misconceptions by Research Colleagues and Research Fellows concerning the purpose of the program, i.e. misunderstanding that the program is generally suitable for repeated research efforts by an individual. We found no abuse of the non-personal services requirements. As expected, enthusiasm is high for the possibilities of follow-on funding by AFOSR at the home university. There is a continuing misconception that SCEEE has responsibility for the Mini-grant Program. Research Fellows are being used effectively to conduct lectures and seminars at most locations.

VII. Pre-Summer Visit (Optional)

After each Research Associate had signed and returned his Appointment Letter to the Southeastern Center, he was directed to contact the designated representative at the laboratory/center of assignment to discuss a pre-summer visit. The purpose of the pre-summer visit is basically threefold: 1) to meet laboratory personnel, especially the Effort Focal Point with whom the Research Associate would be working most closely, and to become personally acquainted with the laboratory facilities; 2) to finalize and formalize objectives for the Research Associate's summer research period and report these to SCEEE; 3) to make arrangements for lodging for the research period. The focus of this visit was on making sufficient preparation so that the summer research effort would be effective.

VIII. SCEEE Fellow Appointment Packet

As a record of documentation supplied to Appointees the SCEEE information and Appointment packets are provided in this report.

INFORMATION BROCHURE
for
SCEEE FELLOWS
on the
1982 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

March 1982

INFORMATION BROCHURE

for

SCEEE FELLOWS

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I. SCEEE FELLOW OBLIGATIONS

SCEEE is required by contract to impose certain obligations on you in your status as a SCEEE Fellow. This section outlines those obligations, and you should read them thoroughly. You are required to sign and return the statement of understanding before the final processing of your appointment can be completed. The following is a list of these obligations:

1. Pre-Summer Visit: A pre-summer visit to your research location is optional. Approval for such a trip may be granted upon your written request to SCEEE along with the written concurrence of the Laboratory/Center representative. The purpose of this visit is to enable you to make your final plans for the summer research period if needed. Reimbursement is paid for allowable travel expenses incurred on a pre-summer trip as indicated in the Allowable Travel Expenses section (page 4) of this brochure. To be reimbursed, you must invoice for it as described in the Information for Invoicing for Compensation and Reimbursement section (page 5) of this brochure.
2. Research Goals and Objectives: A statement of research objectives must be provided to SCEEE prior to the start of the Summer Research period. It should outline your goals and the approach you intend to follow in researching these goals. Neither travel expenses nor expense allowances will be reimbursed until after receipt of your statement of research objectives. The report should also clearly indicate the date of your first working day of the summer research period.
3. Final Report: At the end of your summer research effort, you are required to submit to SCEEE a completed, typewritten scientific report stating the objective of the research effort, the approach taken, results, and recommendations. Information on the required format is included in the "FINAL REPORT INFORMATION BULLETIN" enclosed with this packet. However, the final report must first be approved by your Effort Focal Point and then transmitted so as to reach SCEEE by Monday September 20, 1982. Payment of "Compensation" for the final four weeks of your ten-week research period cannot be made until SCEEE has received and approved this report in the required format.
4. Program Critique: Enclosed you will find a critique form to complete at the end of your research period regarding your impressions of the program. This critique form should be completed and returned to SCEEE by September 30, 1982. Return of this form is a program requirement.

5. U.S. Air Force - SCEEE Fellow Relationship: The U.S. Air Force and SCEEE understand and agree that the services to be delivered by SCEEE Fellows under this contract will be non-personal services and the parties recognize and agree that no employer-employee or master-servant relationships will exist between the U.S. Air Force and the SCEEE Fellows. Non-personal services are defined as work performed by an individual who is responsible for an end item (such as a report), free of supervision of the U.S. Air Force and free of an employer-employee relationship.

As a SCEEE Fellow, you will not: *

- (a) Be placed in a position where you are appointed or employed by a Federal Officer or are under the supervision, direction, or evaluation of a Federal Officer, military or civilian.
- (b) Be placed in a staff or policy-making position.
- (c) Be placed in a position of command, supervision, administration, or control over Air Force military or civilian personnel or personnel of other contractors or become a part of the U. S. Air Force organization.

The services to be performed under the SFRP do not require SCEEE or the SCEEE Fellow to exercise personal judgement and discretion on behalf of the U.S. Air Force; rather, the SCEEE Fellows will act and exercise personal judgement and discretion on their research programs on the SFRP conducted by SCEEE.

The Air Force will have unrestricted use of and access to all data developed during the period of this appointment.

II. ALLOWABLE TRAVEL EXPENSES

The SFRP provides potential funding for two trips between your home and your assigned research location. As soon as you have signed and returned your appointment letter along with the budget sheet, you will be authorized to receive reimbursement for travel expenses as described below.

As outlined in the SCEEE Fellow Obligations section in this brochure, you may make a pre-summer visit in addition to the trip to and from your assigned research location for your summer effort. You are expected to make your own arrangements for these trips, and after the trips you may invoice SCEEE for reimbursement of allowable expenses in the format described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure. Closely coordinate your travel plans with your EFFORT FOCAL POINT.

All travel reimbursements under SCEEE Fellow appointments are made according to current SCEEE policy, and deviations from the approved budget are not authorized and will not be reimbursed. In light of these restrictions, you may choose either to travel by common carrier(s) at coach rates or less, by driving your private auto, or by a combination of both. (Please note that funding for rental cars requires ADVANCED WRITTEN approval by SCEEE and SCEEE will not reimburse this expense unless the prior written approval is obtained.) With any of these choices you may claim reimbursement up to the amount for the most direct routing, taking into the account the desirability of routing on interstate highways if you drive your private auto.

Reimbursement for direct route travel by common carrier(s) will thus be paid on your submission of an invoice to SCEEE following the invoicing instructions referenced above. In the view of the convenience of having a car at the research location, SCEEE strongly recommends that a private auto be used for travel when practical. Reimbursement for mileage when you drive your private auto is at the rate of 20¢ per mile within the routing restrictions mentioned above and will likewise be paid on submission of an invoice prepared according to the referenced instructions. These reimbursements cannot be extended to cover travel by your family if they accompany you on either of these authorized trips.

During the pre-summer visit, you will be authorized to claim a per diem reimbursement at the rate of \$48.00 per day for a maximum of three days spent at your assigned research location. Instructions for claiming this per diem are also described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure.

During the ten week Summer Research period, you will be authorized to receive an expense allowance in lieu of a per diem payment. The rate of this allowance is \$35 per day for a maximum of 70 days. To receive this allowance, you are required to invoice for it as described in the invoicing reference above.

These items above are the only reimbursable travel allowances authorized for the SFRP appointment. Please be advised that any additional travel expenses incurred during the appointment period will be your personal responsibility.

III. INSTRUCTIONS FOR INVOICING FOR COMPENSATION AND REIMBURSEMENT

Attached is a copy of the Invoice Format that you are required to use to obtain compensation or reimbursement from SCEEE. Note that all disbursements by SCEEE for compensation, travel, and/or other expenses are subject to audit approval, so you must submit receipts substantiating charges invoiced.

In addition, you must prepare and attached to each completed invoice a Brief Report of Effort.

A. PREPARATION OF BRIEF REPORT OF EFFORT

Whenever you submit an Invoice for reimbursement to SCEEE you must also include a brief report describing your activities for the invoice period. To meet this obligation, you must prepare, date, sign, and attach to your completed invoice a Brief Report of Effort describing the research accomplished on the appointment and explain any travel during the invoice period.

This report should include innovative techniques and designs or discoveries which may be disclosed as patents. Rights to any inventions or discoveries shall reside with SCEEE unless determined otherwise by the contracting agency.

The Brief report should never exceed one typewritten page and most often should be considerably shorter than one page.

The following is an example of such a report:

BRIEF REPORT OF EFFORT

Effort has been initiated on pole extraction methods. The modified ordinary least squares technique has been giving fair results. Work is presently being done on finding a better matrix inversion technique for the case when the coefficient matrix is ill-conditioned. Some problems have been encountered with conditioning when the data is filtered.

Travel invoice is for the trip to my research location.

_____, June, 16, 1982

B. PREPARATION OF INVOICE FORMAT

Detailed instructions on properly completing your Invoice Format for reimbursement are provided below. Review them carefully.

- (1) In the opening statement of the claim for remuneration on the invoice format, two dates are required. They are the date of your appointment letter from SCEEE (in the first blank) and the date you signed that letter accepting your appointment (in the second blank).

Other financial items required on the Invoice Format are for COMPENSATION, TRAVEL, EXPENSE ALLOWANCE, AND PER-DIEM. These are now explained individually with examples.

(2) COMPENSATION

- (a) In the first blank to the right of COMPENSATION indicate the number of days you are claiming for compensation in this particular invoice next to your SCEEE Fellow daily rate of \$95.00.
- (b) Multiply this number by \$95.00 and enter the total dollar amount in the blank at the far right side. Note that the accumulated total number of days you claim on this appointment may not exceed the number authorized in your appointment letter. Some specific details on the compensation days must be provided in the next space.
- (c) Under the heading Date, list the date of each of the days you are claiming for compensation, and opposite each date under the heading Place of Activity indicate where you worked on that date.

A sample entry of a correctly completed COMPENSATION item is shown below:

SAMPLE COMPENSATION ENTRY ON INVOICE	
<u>COMPENSATION</u> : (<u>10</u> days @ \$95.00 per day)..... \$ <u>950.00</u> (11)	
<u>Date</u> (Specify <u>exact</u> dates)	<u>Place of Activity</u>
June 3,4 1982	AFAPL/POD High Power Lab
June 7-11, 1982 (inclusive)	WPAPB Computer Center
June 14, 15, 16, 1982	AFAPL/POD High Power Lab

(3) TRAVEL

- (a) Under the heading Date indicate the date you departed on your trip and the date you arrived at your destination. If you are invoicing for a round trip, also list the date you departed on your trip and the date you arrived home.
- (b) Under the heading Departure/Arrival Time list the departure and arrival times for the corresponding days you listed under Date.
- (c) List your destination under the heading Destination.
- (d) Under the heading Mode, indicate your principal means of conveyance; i.e., commercial air, private auto, etc.
- (e) Under the heading Amount, itemize these expenditures for travel reimbursement. Continue them on a separate sheet if necessary.
- (f) Total these travel items and enter the total dollar amount to be reimbursed for travel in this particular submission on the line to the right of Total Travel Expense.

Two examples of correctly completed TRAVEL entries are shown below.

EXAMPLE A: PRE-SUMMER VISIT BY AIRLINE AND PERSONAL AUTO.

TRAVEL: (Attach receipts for all Common Carrier charges. Payment cannot be made without receipts attached to invoice.)

<u>Date</u>	<u>Departure/Arrival Time</u>	<u>Destination</u>	<u>Mode</u>	<u>Amount</u>
5/12-5/12/82	0730/0900	Tyndall AFB, FL	Com'l Air	
5/15-5/15/82	0845/1345	Orlando, FL (home)	Com'l Air	\$ 53.00
2 round trips from home to Orlando Airport (Private Auto) (40 miles x 20¢ per mile = \$8.00)				\$8.00
Total Travel Expense				\$ <u>61.00</u> (III)

Please note the following comments about EXAMPLE A:

- i) The \$61 is the sum of all listed travel expenses.
- ii) Travel with use of privately-owned vehicle will be reimbursed at the rate 20¢ per mile; the mileage here does not exceed 100 miles.
- iii) Receipts for the airfare must be attached in order for these charges to be allowed.
- iv) Please remember that SCEEE must give prior written approval for rental car use and without this prior written approval reimbursement for a rental car cannot be paid.

EXAMPLE B: TRAVEL TO RESEARCH LOCATION BY PRIVATE AUTO

TRAVEL: (Attach receipts for all Common Carrier charges. Payment cannot be made without receipts attached to invoice.)

<u>Date</u>	<u>Departure/Arrival Time</u>	<u>Destination</u>	<u>Mode</u>	<u>Amount</u>
5/27-6/2/82	0630/1530	Wright-Patterson AFB, Ohio	Private Auto	\$480.00
One-way trip from home in Eugene, Oregon to Wright-Patterson AFB, Ohio, (2400 mi x 20¢/mi= \$480.00) (mileage at start: 24162; at end: 26562)				
Total Travel Expense				\$ 480.00 (III)

Please note the following comments about EXAMPLE B:

- i) Travel by your private auto in lieu of a commercial carrier is authorized as a convenience to the traveler.
 - ii) Travel with use of a privately-owned vehicle will be reimbursed at the rate of 20¢ per mile provided mileage is listed with the start and end mileage on each separate use for all distances over 100 miles.
- (4) EXPENSE ALLOWANCE
- This item on the invoice will be used to claim the \$35 per day for reimbursement of costs incurred at your assigned research location.
- (a) In the first blank to the right of EXPENSE ALLOWANCE enter the number of days for which you are claiming reimbursement of the expense allowance for costs incurred at your assigned research location.
 - (b) Multiply this number by the daily allowance rate of \$35.00 and enter this total dollar amount in the blank at the far right.
 - (c) Itemize the days for which you are claiming the Expense Allowance reimbursement. It can include weekend days and holidays as well as regular work days. It does not apply to the pre-summer visit.

The following is a sample of a correctly completed EXPENSE ALLOWANCE item.

SAMPLE	
EXPENSE ALLOWANCE: (14 days @ \$35.00/day).....	\$ 490.00 (IV)
Specific dates covered: 7/3/82 - 7/16/82 (inclusive)	

(5) PER-DIEM

This item will be used to claim reimbursement only for Per-Diem charges on the optional pre-summer visit. This cannot exceed three days; only days spent at the actual research site are allowed.

- (a) In the first blank to the right of Per-Diem enter the number of days reimbursement being requested. This entry must correlate with an accompanying lodging receipt.
- (b) Multiply this number by the \$48.00 daily per-diem rate and enter the total dollar amount in the blank at the far right.

Example C below shows a correctly completed PER-DIEM entry.

EXAMPLE C: PER-DIEM ENTRY FOR PRE-SUMMER VISIT

PER-DIEM: (3 days @ \$48.00/day) \$ 144.00 (V)
Attach receipts for motel charges. Per-Diem cannot
be claimed without receipts attached to invoice.)

Please note the following comments about EXAMPLE C:

- i) Per-Diem is not applicable to travel time enroute to or from the research location.
- ii) A day does not qualify for the per-diem reimbursement without a corresponding lodging receipt.
- iii) Each day requested for per-diem reimbursement must be affirmed by a receipt for a night's lodging expense. The lodging receipt must accompany the invoice and must be consistent with the travel reimbursement entry. Note that receipts for lodging for the nights of 5/12, 5/13, 5/14/82 must be attached in order for per-diem of \$48.00 per day to be paid and be consistent with the travel request as illustrated in Travel Example A.
- iv) The Per-Diem payment does not apply to the summer research period; for the summer research period use instead the Expense Allowance reimbursement entry.

- (6) You may combine reimbursement requests for compensation, travel, and per-diem or expense allowance in the same invoice. The total for all items invoiced should be indicated on the blank labeled "GRAND TOTAL FOR INVOICE" in the lower right hand side of line 6.
- (7) IMPORTANT: Indicate in the space provided on each invoice the address to which you want the check mailed.
- (8) You must sign and date your invoice in the lower right hand corner as "VENDOR" before it is submitted; you MUST also have your Effort Focal Point countersign the invoice before it is mailed to SCEEE. Your Effort Focal Point is an Air Force individual at your research location who will be identified prior to your effort start date.

Invoices should be mailed to:

SCEEE SFRP OFFICE
1101 Massachusetts Avenue
St. Cloud, Florida 32769

SUMMER FACULTY RESEARCH PROGRAM
INVOICE FORMAT

(Brief Report of Effort Attached)

1. I claim remuneration from SCEEE, Inc. via the terms and conditions of the agreement dated _____ and accepted _____ as follows:

2. COMPENSATION: (_____ days @ \$95.00 per day).....\$ _____ (II)

Date (Specify exact dates)

Place of Activity

3. TRAVEL: (Attach receipts for all Common Carrier charges. Payment cannot be made without receipts attached to invoice.)

Date

Departure/Arrival Time

Destination

Mode

Amount

Total Travel Expense \$ _____ (III)

4. EXPENSE ALLOWANCE: (_____ days @ \$35.00/day)..... \$ _____ (IV)

Specific dates covered:

5. PER DIEM: (_____ days @ \$48.00/day)..... \$ _____ (V)
(Attach receipts for motel charges. Per-diem cannot be claimed without receipts attached to invoice.)

6. GRAND TOTAL FOR INVOICE (Sum of II, III, IV, V above)..... \$ _____ (VI)

7. Please send check to following address:

8. I certify that compensation invoice is not concurrent with compensation received from other Federal government projects, grants, contracts, or employment.

X

EFFORT FOCAL POINT SIGNATURE

Location of EFP _____

Telephone _____

Date _____

X

VENDOR SIGNATURE

Social Sec. No. _____

Telephone _____

Date _____

FOLLOW-ON RESEARCH POSSIBILITIES

As you are aware, the Air Force Office of Scientific Research sponsors the Summer Faculty Research Program. As a companion program intended to encourage further research work with the Air Force, AFOSR also sponsors the Mini-Grant Program. All SCEE Fellows who have participated in the Summer Faculty Research Program are encouraged to apply for this valuable program. You will receive further information about the Mini-Grant Program during your summer research period. The Mini-Grant Program is administered by AFOSR.

PARTICIPANT'S QUESTIONNAIRE & REPLY SUMMARY

1982 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT)

Name _____ Title _____
Dept. (at home) _____ Home Institution _____
Research Colleague(s) _____
Laboratory Address of Colleague(s) _____
Brief Title of Research Topic _____

A. TECHNICAL ASPECTS

1. Was the offer of research assignment within your field of competency and/or interest?
YES ____ NO ____.

2. Did you have a reasonable choice of research assignment? YES ____ NO ____.
If no, why? _____

3. Was the work challenging? YES ____ NO ____ . If no, what would have make it so? _____

4. Would you classify your summer effort as research? YES ____ NO ____.
Comment: _____

5. Were your relations with your research colleague(s) satisfactory from a technical point of view? YES ____ NO ____ . If no, why? _____

6. Suggestions for improvement of relationship(s). _____

7. Considering the circumstances of a summer program, were you afforded adequate facilities and support? YES ____ NO ____ . If no, what did you need and why was it not provided? _____

8. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length.
Did you accomplish: more than ____, less than ____, about what you expected ____?

9. Do you think that you will continue this or related research efforts upon returning to your home institution (i.e., application for mini-grant and/or other funding)?
YES ____ NO ____ . Give brief explanation of your plans. _____

PARTICIPANT QUESTIONNAIRE (Page 2 of 4)

10. Were you asked to present seminars on your work and/or your basic expertise?
 YES ___ NO ___. Please list number, dates, approximate attendance, length of seminars,
 title of presentations (use reverse side if necessary.)

11. Were you asked to participate in regular meetings in your laboratory? YES ___ NO ___
 If yes, approximately how often? _____

12. Did you perform travel on behalf of the laboratory? YES ___ NO ___.
 Where to? _____

Purpose? _____

13. Give a list of any "special" meetings you may have attended or participated in,
 such as conferences, visiting lectures, etc.

14. Other comments concerning any "extra" activities. _____

15. On a scale of A to D, how would you rate this program? (A high, D low)

Technically challenging	A	B	C	D
Future research opportunity	A	B	C	D
Professional association	A	B	C	D
Enhancement of my academic qualifications	A	B	C	D
Enhancement of my research qualifications	A	B	C	D
Overall value	A	B	C	D

B. ADMINISTRATIVE ASPECTS

1. How did you first hear of this program? _____

2. What aspect of the program was the most decisive in causing you to apply? _____

PARTICIPANT QUESTIONNAIRE (Page 3 of 4)

3. Considering the time of year that you were required to accept or reject the offer, did this cause you any problems of commitment? YES ___ NO ___.

How could it be improved? _____

4. After your acceptance, was information (housing, location, directions, etc.) supplied to you prior to the summer period satisfactory? YES ___ NO ___.

How could it be improved? _____

5. Did you have any difficulty in any domestic aspects (i.e., locate suitable housing, acceptance in community, social life, any other "off-duty" aspects)? YES ___ NO ___.

If yes, please explain. _____

6. How do you rate the stipend level? Meager ___ Adequate ___ Generous ___.

7. How do you rate the importance of the expense-paid pre-program visit to the work site? Not worth expense ___ Convenient ___ Essential ___. Please add any other comments you may have. _____

8. Please give information on housing: Did you reside in VOO ___, apartment ___, other (specify) _____? Name and address of apartment complex and manager's name. _____

9. Please suggest names (and give source) of organization, mailing lists, or other information you think would be helpful in advertising next year's program. _____

10. Do you believe the addition of the Graduate Student Program this year increased the effectiveness of this program? YES ___ NO ___.

11. Did a student work with you? YES ___ NO ___. If so, please comment on the Graduate Student Support influence on your summer research. _____

12. Would you encourage or discourage expansion of the Student Program? _____
Why? _____

PARTICIPANT QUESTIONNAIRE (Page 4 of 4)

13. Considering the many-faceted aspects of administration of a program of this magnitude, how do you rate the overall conduct of this program?
Poor ___ Fair ___ Good ___ Excellent ___. Please add any additional comments. _____

14. Please comment on what, in your opinion, are:

a. Strong points of the program: _____

b. Weak points of the program: _____

15. On balance, do you feel this has been a fruitful, worthwhile, constructive experience?
YES ___ NO ___.

16. Other remarks: _____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY

A. TECHNICAL ASPECTS

1. Assignment in field of competency and/or interest? Yes - 91 No-0

2. Reasonable choice of assignment? Yes - 85 No- 6 If no, why?

3. Work challenging? Yes - 86 No - 5

4. Classify your summer effort as research? Yes - 85 No - 6 Comments:
Applied Research; Provided a start on a research topic, but too much time was required to become familiar with the ongoing programs at the lab to determine where a contribution could be made; Needed preparation for actual experimental effort; Not enough laboratory work; Applied rather than theoretical; Development and Evaluation of requirements; It was good applied research; Most definitely basic research activity; It is a good research area; It proved to be independent research which could have been done more productively at home; Was facilitated by computer compilation of data; Because of equipment failure the majority of time was spent in reviewing the literature, but this was time well spent; This started with an application that generated some research opportunities; Computer programs need to be (first) designed to extract research results; The entire project was completely research oriented; I had the freedom to pursue issues which I did not previously fully understand; Goes beyond current practice and knowledge; A new concept was developed; My effort was challenging area in semiconductor physics; Basic research is done on the development of R-reliable intervals; I performed primarily a teaching activity.

5. Relations with colleague satisfactory? Yes - 86 No - 5 If no, why?
The relations were excellent. The people were very helpful as well as being personable; Had no working knowledge of insurance theory or agency theory. My EFP was helpful in identifying a problem area and in discussing philosophical issues in logistics modeling. However, most of the "technical" collaboration was with other members of XRS; Most of the engineers in the Acoustics & Sonics Fatigue Group are experimentally oriented and could not discuss my analytical project in detail; It was difficult to discuss technical issues in much depth with my colleagues because 1) their activities were largely classified and could not be discussed and 2) their technical backgrounds were not appropriate to fundamental questions in fluid mechanics and aerodynamics; My research colleagues do not have actual experience in any remote sensing techniques.

6. Suggestions for Improvement? 1) Change time window to a period in which office is not so busy, little time was available for technical discussions 2) extend length of program. Ten weeks is not enough to support both performing research and acquiring the background information needed; Interaction with other members of the organization-meetings, seminars, etc.; They were fine; No problems; excellent cooperation; The general research environment would be improved by more in-house research projects; None- the interaction was completely satisfactory; a) a possible presentation of seminar on summer accomplishments and b) participation, if possible, in lab meetings; They were very good; Impossible- it was a perfect relationship; Maybe periodic meetings on technical topics of mutual interest would help; All my interactions with colleagues were very positive; Better understanding of SCEE-SFRP objectives and goals.

Participant Summary
Page Two

Misunderstanding of basic concepts may lead a bad relationship/impression; The research colleague should get more involved in the project; None, an excellent relationship from a technical point of view; Suggest about as many days of calendar designated time in advance and agreed upon by EFP for meetings with specific individuals. This planning is needed in a short schedule of 10 weeks; It could be made more clear that a pre-summer visit is an awfully good thing to make. I didn't, and this created several minor difficulties, none technical though; My research colleague was the best person I've ever worked for. He's interested in solving problems and stayed in touch with my work. He facilitated my interface with Lab & Albuquerque; Help each other and keep contact with them before and after the tenure of his appointment; More time should be spent together in the development of research.

7. Afforded adequate facilities? Yes - 86 No - 5
8. Accomplishment in ten weeks? More than expected - 10, Less than expected - 15,
About what expected - 66
9. Will you continue this or related research efforts? Yes - 86 No - 5
10. Asked to present seminars? Yes - 47 No - 44
11. Asked to participate in meetings? Yes - 47 No - 44
12. Traveled on behalf of laboratory? Yes - 12 No - 79
13. Participated in "Special" meetings? Yes - 37 No - 54
14. Other comments on extra activities? Attended classes at UCSD-Pascal operating systems for minicomputers and a briefing on time-series analysis; My research agenda precluded time for traveling to special meetings; Good exchange of information; Attended a couple of video seminars; Held discussions of research topics; Toured the AEDC facility; Didn't have time; Attended a Board of Directors (AFBRMC) meeting; Tried to help lab staff with on-going projects as much as time allowed; Wrote an AEDC report; Visits to local contractors.
15. Technically Challenging? A - 63 B - 25 C - 3 D - 0
Future Research Opportunity? A - 68 B - 19 C - 2 D - 2
Professional Association? A - 66 B - 21 C - 2 D - 1
Enhancement of my academic qualifications? A - 39 B - 40 C - 10 D - 1
Enhancement of my research qualifications? A - 52 B - 31 C - 7 D - 0
Overall value? A - 65 B - 23 C - 2 D - 0

B. ADMINISTRATIVE ASPECTS

1. First hear about program? Discussion with a staff member at RADC; From the SCEEE Announcement sent to the school; From a colleague; From an Air Force friend; Through my department; Great Lakes Colleges Association Newsletter; Air Force Bulletin; AFOSR; Participation last year; From friends

2. Decisive aspect of application? I wanted to generate research contacts with people close to my institution; The opportunity to do research at Air Force Organizations in the summer and to be associated with scientists from the Air Force; The hope for a technically broadening experience; Basic research in area of interest; Financial differential over similar Navy, NASA programs; Research opportunity; contracting potential; New professional associations and to find out about the Air Force's research funding; Opportunity to initiate large-scale project of potential interest to funding agency; Mini-grant Program; Opportunity to get access to high technology equipment; Flexibility in timing and research area, location was small positive factor.

3. Commitment to program a problem? Yes - 13 No - 78 If yes, explain? Time may extend two to three weeks to either end; offer be extended one + half months before end of semester so that the faculty can have time to decide on whether or not to accept summer employment at the University; Earlier decision time; Move date back to January; Should really be a late fall decision, summer schedules often firmed by then; More time to decide

4. Program information satisfactory? Yes - 72 No - 18

5. Problems in domestic aspects? Yes - 15 No - 76 If yes, explain? Locating housing. VOQ was full, many apartments were unavailable at the start of the program; We rented a house in Yellow Springs and were very happy; My housing cost more than \$35/day; Locating housing after VOQ fell through; There was a minor problem cashing checks. This was done through friends in the area; Very difficult to arrange housing for 10 weeks in resort area at reasonable rates; Finding suitable family housing; Due to short stay people were hesitant to rent; the housing I found was atrocious. The apartment was poorly constructed and maintained

6. Stipend level? Meager - 19 Adequate - 64 Generous - 8

7. Preprogram visit? Not worth expense - 2 Convenient - 23 Essential - 60
N/A - 6

8. Housing information? VOQ - 27 Apartment - 28 Other - 36

9. Mailing list suggestions? IEEE; University of Arizona, Dept. of Nuclear & Energy Engineering; Americal Psychological Assn., Academy of Mgmt; Advertise in Physics Today classified section; Human Factors Bulletin; Oklahoma State University/School of I.E. & Mgmt, Stillwater, OK 74078; Ask SCEEE Fellows to recommend other candidates; University of Lowell; University Info. & Development Offices; Physics Depts of Universities; Head, Chmn. Physics Dept. Wright State University, Dayton, OH 45433; Send announcement to this participants and ask them to pass along; IEEE, ASEE, AAUD, Electronics Engineering; Americal Ceramic Society; Dean/Chrmn of various Engineering Dept; ASEE regional conference; Chemical And Engineering News; SIAM; Assn. Comp. Machinery; Place information in Professional journals

Participant Summary
Page Four

10. Addition of Graduate Student Program increased effectiveness of program?
Yes - 50 No - 12
11. Did a Student work with you? Support on summer research? Yes - 17 No - 74 Comments on Graduate Student
Would have been more helpful if a stronger student had been available; The grad student allows a team effort approach definitely allowing deeper and broader research efforts on a problem; Not only did he have the opportunity to learn about research methodology but his contribution in terms of helping in literature review, computations, and broadening the scope of the work were a great asset; Forms arrived too late for me to get a student. Also not clear if I could use a foreign student? Most are foreign; It facilitated tremendously my research work almost doubling the amount of work that I was able to produce; Expanded research goals, increased background research, and increased the depth and quality of the work; I would have liked to have had a student working with me on this project; It allowed by student to get started on his thesis work and make potential "job offer" contacts
12. Encourage or Discourage expansion of Student program? Encourage - 70
Discourage - 2
13. Program administration overall rating? Poor - 0 Fair - 1 Good - 24
Excellent - 66
14. A. Strong Points of the Program? Good to get insights into needs and scientific/engineering activities of Air Force. I learned a lot; Exposure to Lab personnel and facilities capabilities and attitudes that should prove valuable in targeting follow-up or future research proposals; Full time research opportunity broadening of professional perspectives, learning opportunities, establishing solid relationships with other scientists; Opportunity to work with highly competent individuals; Gives a good opportunity to start a basic research and its applications some of the problems which develop in actual testing.
- B. Weak Points of the Program? Too short a time period for some efforts; The lack of information about tax status; Was not clear we were to sign every "Brief Report"; SCEEE administration at Wright-Patterson; Conflicting goals between AFOSR and specific research offices; All the paper work; Limited duration of program; Meagre compensation; No regular meetings of SFRP Participants; Distance from home; No follow-up; Aid in getting housing; Not enough positions; The summer program should be integrated into some on-going in-house research study; I consider the withholding of pay, until the final report is received, a non-professional rule. I recommend that faculty members be paid for Federal Holidays; Advertisement of program can be improved to reach minority faculty at all Universities of higher education, including historically Black colleges and Universities.
15. Has this been a fruitful, worthwhile, constructive experience?
Yes - 91 No - 0

RESEARCH COLLEAGUE'S QUESTIONNAIRE & REPLY SUMMARY

1982 USAF/SCREE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT'S RESEARCH COLLEAGUE)

Name _____ Title _____
Division/Group _____ Laboratory _____
Name of Participant _____

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of the Associate's capabilities prior to arrival at work site? YES _____ NO _____ If yes, where/how/what? _____

2. Was the Faculty Associate prepared for his project? YES _____ NO _____
3. Please comment on his preparedness/competency/scope/depth of knowledge of subject area:

4. Please comment on the Associate's cooperativeness, diligence, interest, etc. _____

5. In your opinion, has his participation in this summer program contributed to an increase in the Associate's potential to perform research? YES _____ NO _____. Comments: _____

6. Did work performed by the Associate contribute to the overall mission/program of your laboratory? YES _____ NO _____ If yes, how? _____

7. Would you classify the summer effort under the SFRP as research? YES _____ NO _____.
Comment: _____
8. Was a Graduate Student assigned to your group this summer? YES _____ NO _____.
If so, did this enhance the research productivity? YES _____ NO _____.
Was it an administrative burden? YES _____ NO _____.

9. Were your relations with the Associate satisfactory from a technical point of view?
YES _____ NO _____. Suggestions as to how they might be improved: _____

COLLEAGUE QUESTIONNAIRE (Page 2 of 3)

10. Do you think that by having a Faculty Associate assigned to your group, others in the group benefited and/or were stimulated by his presence? YES ___ NO ___.

Comments: _____

11. Do you feel that the introduction to each other, together with the summer work experience and performance could form a sound basis for continuation of effort by Associate at his home institute? YES ___ NO ___. If yes, how? _____

If no, why not? _____

12. One of the objectives of this program is to identify sources of basic research capability and availability to the USAF. On a scale of A to D, how effective do you think this program will be in that respect? (A high, D low):

A B C D

13. Also, please evaluate (A high, D low):

Opportunity to stimulate group activity	A	B	C	D
Professional association	A	B	C	D
Program administration	A	B	C	D

COLLEAGUE QUESTIONNAIRE (Page 3 of 3)

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of this program? _____

2. Were you involved in the screening and prioritizing of the faculty applicants for your lab? YES ___ NO ___. If yes, do you have any suggestions for improvement of the procedures used? _____

3. How do you rate the importance of the expense-paid pre-program visit to the work site? Not worth expense ___ Convenient ___ Essential ___. Please add any comments: _____

4. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length. Were you as a team able to accomplish more than ___, less than ___, about what you expected ___?
Comments: _____

5. Would you desire another Faculty Associate to be assigned to you and/or your group/division? YES ___ NO ___. If no, why not? _____

6. Would you desire additional Graduate Students in this program? YES ___ NO ___.
7. Should the Graduate Students continue to be assigned to research with the Summer Research Faculty Member? YES ___ NO ___.
8. Should Graduate Students also be assigned without Summer Research Faculty supervision? YES ___ NO ___.
9. Other remarks: _____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY

A. Technical Aspects

1. Did you have personal knowledge of Associates' capabilities?
Yes - 51 No - 31

2. Was Associate prepared? Yes - 80 No - 2

3. Comments on preparedness, etc. in subject area? Competent and thorough; well planned; his knowledge of computer graphics is excellent; well prepared for work in the area of project; completely prepared to work here; he wrote his Ph.D. dissertation in the subject area, he kept current with the research in this area, has several publications in this area; excellent background; we were able to make a reasonable assessment based on the resume supplied during the selection process; very broadly qualified; what he was deficient was corrected by a short but rigorous background research; he is a highly qualified microbiologist who enjoys an excellent reputation in medical aspects of microbiology; he was totally prepared to assist in analyzing our non-destructive pavement evaluation system; he was very well prepared and obviously very cognizant of the subject area, he was able to start before the official starting date; well qualified individual - weakest point is lack of exposure to operational environment; his background knowledge should be considered superior, he showed a broad background of technical and theoretical knowledge in his field of expertise; laboratory facilities for conducting similar research do not exist at the home college and his educational background and training were not adequate for the work attempted; totally prepared and highly competent in the assigned tasks; has been here three weeks and already has made a major contribution to a key project; professor is completing an effort started last summer, his specific knowledge of Adaptive Kalman Tracking Filters resulted in his being appointed for a second summer; he has performed similar research elsewhere and is among the experts in this work; faculty associate prepared himself exceedingly well by keeping close contact with lab personnel prior to arrival.

4. Comments on cooperativeness? Excellent; a pleasant gentleman to work with; professor is very cooperative and works well with other researchers; very diligent and hard working; highly cooperative; good interest in program; hard worker, stayed busy, evidenced interest in all areas of aeroelasticity; outstanding drive and motivation, completed 10 months work in 10 weeks; extremely cooperative and diligent, showed much initiative; professor is easy to communicate with, works independently and shows extensive interest in his work; immediately interested in the program - diligent in seeking out information; he fits in with our group well; a most energetic and personable individual; he worked long hours in gaining full understanding of the problems he was to research, he lacked diligence, his enthusiasm and interest in the program seemed modest at best; demonstrated unique ability to focus on key problem areas and get a job done; above average; excellent; helped other workers with their projects; took interest in wide variety of problems; worked with no prodding from the government, never missed a day of work; professor has put in extra hours even though his office air conditioner quits at 1615 and his office has no windows; absolutely outstanding; professor appeared capable of performing necessary manipulations but did not always work an eight-hour day; very enthusiastic about the research as well as sharing knowledge gained with other members of the research team; his leadership as well as personal efforts have spearheaded 2 major experiments here, we've doubly benefited from him; I would like to have a associate with us full time, he is eager, quick, and highly adaptable.

Evaluation Summary
Page Two

5. Increase in Associates' research potential? Yes - 81 No - 1
6. Did work performed contribute to overall laboratory mission?
Yes - 81 No - 1
7. Would you classify the summer effort as research? Yes - 82 No - 0
8. Graduate Student assigned to group this summer? Yes - 37 No - 45
Enhance research? Yes - 37 No - 0
Administrative burden? Yes - 0 No - 37
9. Were technical relations with associate satisfactory? Yes - 82 No - 0
10. Did Associate stimulate others? Yes - 78 No - 4
11. Will summer experience and performance form basis for continuation effort by Associate? Yes - 76 No - 6
12. Effectiveness in respect to capabilities and availability to USAF?
A - 48 B - 31 C - 2 D - 1
13. Opportunity to stimulate group activity? A - 55 B - 23 C - 4 D - 0
Professional association? A - 62 B - 16 C - 2 D - 0
Program administration? A - 45 B - 33 C - 4 D - 0

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of program? *Answers ranged from several years to present.*
2. Involved in screening and prioritizing? Yes - 52 No - 30
3. Expense paid pre-program visit? Not worth expense - 2 Convenient - 21
Essential - 57
4. Please comment on program length? How much accomplished? More than - 17
Less than - 9 What expected - 56
5. Want another participant? Yes - 80 No - 2
6. Additional Graduate Students? Yes - 60 No - 12
7. Should Graduate Students continue to be assigned with faculty member?
Yes - 46 No - 6
8. Should Graduate Students also be assigned without faculty supervision?
Yes - 31 No - 21

Evaluation Summary

Page Three

9. Other comments? I was finally able to get someone to work on a difficult basic EM theory problem of use to us; joint assignment has the potential for work at the home university after the summer project; we very much would like to have him assigned for future research projects with our office; his contribution to our overall objectives is extremely valuable; mini-grant funds should be available in the behavioral science area, for use in advancing the technology associated with the safety of AF operations; this program has been extremely useful to this division; we were fortunate to have someone of his capabilities to assist us in the early phases of work on this EM propulsion project; no experience with Graduate Students; overall, very impressed with the program; the program is excellent and should be continued; suggest consideration given to Graduate Student support in mini-grant program; this program provides cross fertilization we deeply need; we had no Grad Students - Can we get one next year?; program works well with limited administrative paperwork; excellent program for both AFGL and the faculty community; excellent program, we could not have covered this area without it; overall, very worthwhile program; I sincerely believe that the program from my limited point of view and experience is getting better; this is a vital program for us, we benefit greatly from experts coming in from the outside, we recruited our last two participants, this is probably the best way to get the most output.

LABORATORY REPRESENTATIVE'S QUESTIONNAIRE & REPLY SUMMARY

1982 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY LABORATORY REPRESENTATIVE)

Laboratory/Center _____

Name _____

1. How do you rate the correspondence, verbal and telephone communication, and other aspects concerning program administration? Poor ___ Average ___ Good ___ Excellent _____.
How could it be improved? _____

2. The participant selection process is two-fold: academic and technical. Did you have sufficient time to conduct an adequate evaluation of applications? YES ___ NO _____.
Comments: _____

3. Was the number of faculty associates assigned to your organization satisfactory? YES ___ NO _____. If not, how many would be desired? _____
How do you determine this number? _____

4. Please rate the expense-paid pre-program visit:
Not worth the expense ___ Convenient ___ Essential _____.

5. In your opinion is the ten-week time period an optimum length of time to obtain the objective of providing the introduction to each other (associates and laboratory/center personnel and programs)? YES ___ NO _____. If no, what length would it be? _____
Other comments: _____

6. Did your laboratory/center establish a seminar program (or other means) to "tap" the faculty associate's academic knowledge (other than his research assignment)? YES ___ NO _____. If yes, give description and evaluation. _____

7. Did the laboratory/center conduct a general briefing, tour, and/or other formal means of welcome and introduction for the associate(s) assigned to your organization? YES ___ NO _____.

8. Did you have a formal exit exercise for each associate (such as a final technical briefing presented to the organization management, a private interview, or other)? YES ___ NO _____.

LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 2 of 2)

9. In your opinion, what was the overall quality of this year's participants as measured by attitude, technical competence, work habits, production and meaningful research accomplishment?

[Note: These answers will be held confidential.]

List Name(s)

Poor Average Excellent Superior

10. Do you believe the addition of the Graduate Student Program enhances the Summer Research Program? YES ___ NO ___.

11. Was a student assigned under the Graduate Student Summer Support Program to your laboratory this summer? YES ___ NO ___.

If so, was their participation productive? YES ___ NO ___.

12. Please furnish any recommendations you may have on improving the Graduate Student segment of the program. _____

13. Please furnish any other comments or suggestion to improve the program in future years. _____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY

1. Rate Correspondence? Poor - 0 Average - 0 Good - 6 Excellent - 12
2. Sufficient time for evaluation? Yes - 16 No - 2
3. Number of associates satisfactory? Yes - 11 No - 7
4. Rate pre-program visit? Not worth expense - 2 Convenient - 2
Essential - 13
5. Ten week period an optimum amount of time? Yes - 13 No - 5
6. Established seminar program? Yes - 6 No - 12
7. Conduct Briefing? Yes - 14 No - 4
8. Exit exercise? Yes - 13 No - 5
9. Quality of participants? Poor - 0 Average - 10 Excellent - 35
Superior - 36
10. Addition of Graduate Student Program enhances SFRP Program?
Yes - 14 No - 0
11. Was student assigned to your laboratory? Yes - 9 No - 9
Was their participation productive? Yes - 9 No - 0
12. Recommendations on improving Graduate Student segment of program? Earlier announcement; have faculty applicants indicate on application if they are willing to work with a student; extension of program to include year-round, summer and any semester; increase remuneration; Graduate Students should continue to be assigned with faculty as a package deal; the program should be extended for at least two additional weeks; pre-summer visit is essential.
13. Additional comments or suggestions? Provide more slots; increase the mini grant to \$20,000; provide the highest possible pay in order to recruit more faculty from major universities; emphasis should be placed on: a) recruiting younger people and, b) from lesser known universities.

APPENDIX I

- 1. Program Statistics**
- 2. List of 1982 Participants**
- 3. Participant Laboratory Assignments**

1982 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

Conducted by
SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION, INC.

PROGRAM STATISTICS

1. Number of Air Force Installations (Laboratory/Centers) - 25

2. Applications Received (First Choice as Follows) - 405

APL	(W-PAFB)	- 24	HRL/FTD	(Williams)	- 8
AMRL	(W-PAFB)	- 23	HRL/PRD	(Brooks)	- 21
AD	(Eglin)	- 26	HRL/TTD	(Lowry)	- 8
AEDC	(Arnold)	- 11	LMDC	(Maxwell)	- 13
AL	(W-PAFB)	- 14	LC	(W-PAFB)	- 8
BRMC	(W-PAFB)	- 15	LMC	(Gunter)	- 4
ESMC	(Patrick)	- 6	ML	(W-PAFB)	- 21
ESD	(Hanscom)	- 18	RPL	(Edwards)	- 10
ESC	(Tyndall)	- 26	RADC	(Griffiss)	- 27
FDL	(W-PAFB)	- 21	RADC/ET	(Hanscom)	- 14
FJSRL	(USAF)	- 10	SAM	(Brooks)	- 29
GL	(Hanscom)	- 16	WL	(Kirtland)	- 18
HRL/ASD	(W-PAFB)	- 14			

3. Number of Participants - 91

Number holding Doctorate Degree	89
Number holding Masters Degree	2
Number holding Professor Rank	22
Number holding Associate Professor Rank	30
Number holding Assistant Professor Rank	36
Number holding Instructor Rank	0
Number holding Chairman Rank	3

4. Average Age of Participants - 41.6 years

5. Distribution of Participants Location

APL	(W-PAFB)	- 7	HRL/FTD	(Williams)	- 2
AMRL	(W-PAFB)	- 7	HRL/PRD	(Brooks)	- 2
AD	(Eglin)	- 7	HRL/TTD	(Lowry)	- 1
AEDC	(Arnold)	- 2	LMDC	(Maxwell)	- 1
AL	(W-PAFB)	- 6	LC	(W-PAFB)	- 1
BRMC	(W-PAFB)	- 2	LMC	(Gunter)	- 1
ESMC	(Patrick)	- 1	ML	(W-PAFB)	- 6
ESD	(Hanscom)	- 1	RPL	(Edwards)	- 2
ESC	(Tyndall)	- 5	RADC	(Griffiss)	- 5
FDL	(W-PAFB)	- 6	RADC/ET	(Hanscom)	- 2
FJSRL	(USAF)	- 2	SAM	(Brooks)	- 9
GL	(Hanscom)	- 5	WL	(Kirtland)	- 6
HRL/ASD	(W-PAFB)	- 2			

PROGRAM STATISTICS - PAGE TWO

6. Disciplines Represented - 23

Accounting/Information Systems	- 1	Electrical Eng./Computer Science	- 17
Aerospace Mechanical & Nuclear Engineering	- 7	Engineering Management	- 4
Aerospace & Ocean Engineering	- 2	Graduate School of Social Work	- 1
Biology	- 3	Industrial Eng./Systems Eng. & Management	- 6
Ceramic Engineering	- 1	Mathematical Eng. & Science	- 8
Chemical Engineering	- 3	Mathematics/Statistics/Computer Science/Information Science	- 4
Chemistry	- 5	Nuclear & Energy Engineering	- 1
Civil & Environmental Eng.	- 4	Physics & Astronomy	- 13
Division of Behavioral Science	- 1	Physiology	- 1
Early Childhood & Special Ed.	- 1	Psychology	- 5
Economics	- 1	Systems Analysis	- 1
Educational Psychology	- 1		

7. Number of Colleges/Universities Represented - 62

Alabama, University of	New Mexico, University of (2)
Alabama A & M (2)	New Orleans, University of
Arizona, University of	North Carolina Central University
Auburn University (3)	North Carolina State University
Boston University (2)	North Dakota State University
California State University (2)	Northwest Missouri State University
Carnegie-Mellon University	Notre Dame, University of
Cedarville College	Oberlin College
Cincinnati, University of	Ohio Northern University
Clarkson College	Ohio State University (3)
Clemson University	Oklahoma, University of (4)
Colorado, University of	Oklahoma State University
Dayton, University of (2)	Old Dominion University
Florida, University of (4)	Pennsylvania State University (4)
Florida Institute of Tech.	Rose-Hulman Institute
George Mason University	Rust College
Georgia, University of	South Florida, University of
Georgia Institute of Tech. (4)	Southern University (2)
Illinois, University of	State University of New York
Kansas, University of (2)	Stevens Institute of Technology
Kent State University	Tennessee Tech. University
Kentucky, University of	Texas, University of (2)
Lamar University	Vermont, University of
Lowell, University of (2)	Virginia Polytechnic Inst. & St. Univ.
Mercer University	Washington State University
Miami, University of	Wayne State University (2)
Miami University	Western Carolina University
Michigan Tech. University	Wilberforce University
Mississippi State University	Wittenberg University
Missouri, University of (2)	Wright State University (3)
Nebraska, University of	

PROGRAM STATISTICS - PAGE THREE

8. Number of States Represented - 30

Alabama
Arizona
California
Colorado
Florida
Georgia
Illinois
Indiana
Kansas
Kentucky
Louisiana
Massachusetts
Michigan
Mississippi
Montana

Nebraska
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Pennsylvania
South Carolina
Tennessee
Texas
Vermont
Virginia
Washington

LIST OF PARTICIPANTS

Page 1

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Prof. Richard G. Absher Professor University of Vermont Electrical Engineering Department Burlington, VT 05405 (802) 658-3330	<u>Degree:</u> Ph.D., Electrical Engineering, 1967 <u>Specialty:</u> Digital Systems, Modern Control Theory, Biomedical Engineering <u>Assigned:</u> RADC/Griffiss
Dr. Milton J. Alexander Professor Auburn University Management Department Auburn, AL 36830 (205) 826-4730	<u>Degree:</u> D.B.A., Management, 1968 <u>Specialty:</u> Management Information Systems, Operational Research <u>Assigned:</u> LMC
Dr. Gary L. Allen Assistant Professor Old Dominion University Psychology Department Norfolk, VA 23508 (804) 440-4444	<u>Degree:</u> Ph.D., Psychology, 1979 <u>Specialty:</u> Cognitive Psychology, Perception, Developmental Psychology <u>Assigned:</u> HRL/B
Dr. Silverio P. Almeida Professor Virginia Tech. Physics Department Blacksburg, VA 24061 (703) 961-5473	<u>Degree:</u> Ph.D., Physics <u>Specialty:</u> Laser Applications to Biophysics and Pattern Recognitions Problems <u>Assigned:</u> SAM
Dr. Muluneh Azene Assistant Professor Southern University Civil Engineering Department Baton Rouge, LA 70813 (504) 771-5871	<u>Degree:</u> Ph.D., Structural Mechanics, 1979 <u>Specialty:</u> Finite Element Analysis <u>Assigned:</u> ESC
Dr. Francesco L. Bacchialoni Associate Professor University of Lowell Electrical Engineering Dept. Lowell, MA 01854 (617) 452-5000	<u>Degree:</u> Ph.D., Engineering, 1946 <u>Specialty:</u> Control Systems, Signal Processing <u>Assigned:</u> GL
Dr. A. Terry Bahill Associate Professor Carnegie-Mellon University Electrical Engineering Dept. Pittsburg, PA 15213 (412) 578-2536	<u>Degree:</u> Ph.D., Electrical Engineering, 1975 <u>Specialty:</u> Biological Control Systems <u>Assigned:</u> AMRL

LIST OF PARTICIPANTS

Page 2

NAME/ADDRESS

DEGREE, SPECIALTY, LABORATORY
ASSIGNED

Dr. Mason G. Bailey
Associate Professor
Western Carolina University
Accounting/Information Systems Dept.
Cullowhee, NC 28723
(704) 227-7401

Degree: Ph.D., Computer Science,
1978
Specialty: Computer Science,
Operations Research
Assigned: HRL/WP

Dr. Pradip M. Bakshi
Professor
Boston College
Physics Department
Chestnut Hill, MA 02167
(617) 969-0100

Degree: Ph.D., Theoretical
Physics, 1962
Specialty: Theoretical Plasma
Physics
Assigned: GL

Dr. Gust Bambakidis
Assistant Professor
Wright State University
Physics Department
Dayton, OH 45435
(513) 873-2954

Degree: Ph.D., Physics, 1966
Specialty: Theoretical Physics
Assigned: ML

Prof. Albert W. Biggs
Professor
University of Kansas
Electrical Engineering Department
Lawrence, KS 66045
(913) 864-4615

Degree: Ph.D., Electrical
Engineering, 1965
Specialty: Microwaves, Antennas,
and Wave Propagation
Assigned: RADC/Hanacom

Dr. Jack J. Bourquin
Associate Professor
University of Missouri
Electrical Engineering Department
Rolla, MO 65401
(314) 341-4548

Degree: Ph.D., Electrical
Engineering, 1968
Specialty: Circuits and Systems
Assigned: AL

Dr. Willie A. Bragg
Assistant Professor
University of Cincinnati
Early Childhood & Special Education Dept.
Cincinnati, OH 45221
(513) 475-4542

Degree: Ph.D., Special
Education, 1979
Specialty: Mental Retardation,
Early Childhood
Education
Assigned: SAM

Dr. Eugene F. Brown
Associate Professor
VPI & SU
Mechanical Engineering Department
Blacksburg, VA 24061
(703) 961-7199

Degree: Ph.D., Mechanical
Engineering, 1968
Specialty: Fluid Mechanics,
Computational Fluid
Dynamics
Assigned: APL

LIST OF PARTICIPANTS

Page 3

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Sherman D. Brown Professor University of Illinois Ceramic Engineering Department Urbana, IL 61801 (217) 333-4766	<u>Degree:</u> Ph.D., Chemical Engineering, 1957 <u>Specialty:</u> Brittle Fracture, Ceramic Coatings, Glasses, High Temperature Materials <u>Assigned:</u> ML
Dr. Louis W. Buckalew Assistant Professor Alabama A&M University Psychology Department Normal, AL 35762 (205) 859-7451	<u>Degree:</u> M.S. & (ABD), Physiological Psychology, 1969 & (1979) <u>Specialty:</u> Physiological Psychology, Psychopharm, Human Engineering <u>Assigned:</u> AMRL
Dr. Donald L. Byrket Associate Professor Miami University Systems Analysis Department Oxford, OH 45046 (513) 523-2325	<u>Degree:</u> Ph.D., Industrial Engineering, 1974 <u>Specialty:</u> Mathematical Modeling, Management Science <u>Assigned:</u> LC
Dr. Jimmie J. Cathey Associate Professor University of Kentucky Electrical Engineering Department Lexington, KY 40506 (606) 258-4684	<u>Degree:</u> Ph.D., Electrical Engineering, 1972 <u>Specialty:</u> Analysis, Design, and Control of Electrical Machinery <u>Assigned:</u> APL
Dr. Roger E. Cavallo Associate Professor State University of New York Computer & Information Science Dept. Utica, NY 13502 (315) 792-3315	<u>Degree:</u> Ph.D., Systems Science, 1978 <u>Specialty:</u> Systems Methodology <u>Assigned:</u> RADC/G
Dr. Junho Choi Assistant Professor Florida Institute of Technology Dept. of Electrical Engineering & CP Melbourne, FL 32901 (305) 723-3701	<u>Degree:</u> Ph.D., Electrical Engineering, 1978 <u>Specialty:</u> Digital Signal Processing, Control Systems <u>Assigned:</u> ESMC
Dr. David L. Cleeton Assistant Professor Oberling College Economics Department Oberlin, OH 44074 (216) 775-8482	<u>Degree:</u> Ph.D., Economics, 1980 <u>Specialty:</u> Microeconomics, Labor Economics, Public Finance <u>Assigned:</u> BRMC

LIST OF PARTICIPANTS

Page 4

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Gregory M. Corso Assistant Professor Georgia Institute of Technology Psychology Department Atlanta, GA 30332 (404) 894-4260	<u>Degree:</u> Ph.D., Engineering Psychology, 1978 <u>Specialty:</u> Human Performance Theory, Engineering Psychology <u>Assigned:</u> AMRL
Dr. Robert A. Douglas Professor North Carolina State University Civil Engineering Department Raleigh, NC 27650 (919) 737-2331	<u>Degree:</u> Ph.D., Engineering, 1956 <u>Specialty:</u> Mechanics of Solids, Impact and Stress Wave Propagation <u>Assigned:</u> ESC
Dr. Hamed K. Eldin Professor Oklahoma State University Industrial Engineering & Management Dept. Stillwater, OK 74078 (405) 624-6055	<u>Degree:</u> Ph.D., Industrial Engineering, 1951 <u>Specialty:</u> Project Management, Economic Analysis Inventory Theory <u>Assigned:</u> BRMC
Dr. John D. Enderle Assistant Professor North Dakota State University Electrical Engineering Department Fargo, ND 58105 (701) 237-7689	<u>Degree:</u> Ph.D., Biomedical Engineering, 1980 <u>Specialty:</u> Epidemiology, Signal Processing, Statistical Methods & Modeling <u>Assigned:</u> SAM
Dr. Fernando E. Fagundo Assistant Professor University of Florida Civil Engineering Department Gainesville, FL 32611 (904) 392-0851	<u>Degree:</u> Ph.D., Structural Engineering, 1980 <u>Specialty:</u> Analysis and Design of Reinforced Concrete Structural Systems, <u>Assigned:</u> ESC
Dr. Hubert S. Feild Associate Professor Auburn University Management Department Auburn, AL 36830 (205) 826-4039	<u>Degree:</u> Ph.D., Psychology, 1973 <u>Specialty:</u> Industrial Psychology <u>Assigned:</u> LMDC
Dr. Mack Felton, Jr. Chairman Southern University Biology Department New Orleans, LA 70126 (504) 282-4401	<u>Degree:</u> Ph.D., Microbiology, 1973 <u>Specialty:</u> Microbiology <u>Assigned:</u> SAM

LIST OF PARTICIPANTS

Page 5

NAME/ADDRESS

DEGREE, SPECIALTY, LABORATORY
ASSIGNED

Dr. William L. Filippone
Associate Professor
University of Arizona
Nuclear & Energy Engineering Dept.
Tucson, AZ 85721
(602) 626-2514

Degree: Ph.D., Nuclear Engineering,
1970
Specialty: Charged and Neutral
Particle Transport Theory
Assigned: RADC/Hanacom

Dr. Dennis R. Flentge
Assistant Professor
Cedarville College
Math & Science Department
Cedarville, OH 45314
(513) 766-2211

Degree: Ph.D., Physical Chemistry,
1974
Specialty: Surface Chemistry,
Catalysis and IR
Spectroscopy
Assigned: APL

Dr. Wilfred A. Fordon
Associate Professor
Michigan Technological University
Electrical Engineering Department
Houghton, MI 49931
(906) 487-2550

Degree: Ph.D., Electrical Engineering,
1976
Specialty: Electromagnetic Theory,
Pattern Recognition
Assigned: ESD

Dr. Larry J. Forney
Associate Professor
Georgia Institute of Technology
Chemical Engineering Department
Atlanta, GA 30332
(404) 894-2825

Degree: Ph.D., Engineering Science,
1974
Specialty: Dynamics and Chemistry of
Turbulent Jets and Plumes
Assigned: AEDC

Dr. Albert J. Frasca
Associate Professor
Wittenberg University
Physics Department
Springfield, OH 45501
(513) 327-7821

Degree: Ph.D., Physics, 1966
Specialty: Low Energy Nuclear Physics,
Solid State Physics
Assigned: AL

Dr. Andris Freivalds
Assistant Professor
Penn State University
Industrial & Mgmt. Systems Eng. Dept.
University Park, PA 16802
(814) 863-2361

Degree: Ph.D., Bioengineering, 1979
Specialty: Human Factors, Biomechanics,
Work Physiology
Assigned: AMRL

Dr. Mark A. Fugelso
Assistant Professor
Penn State University
Industrial Engineering Department
University Park, PA 16802
(814) 863-2360

Degree: Ph.D., Microprocessor
Controlled Twist Drill
Grinding Machine, 1978
Specialty: Digital Computer Control
of Special Machine Tools &
Robots
Assigned: ML

LIST OF PARTICIPANTS

Page 6

NAME/ADDRESS

	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Prof. Eugene H. Galluscio Professor Northwest Missouri State University Psychology Department Maryville, MO 64468 (816) 582-7141	<u>Degree:</u> Ph.D., Physiological Psychology, 1970 <u>Specialty:</u> Neuropsychology, Brain Function, Visual Information Processing <u>Assigned:</u> HRL/Williams
Dr. Ronald L. Greene Assistant Professor University of New Orleans Physics Department New Orleans, LA 70148 (504) 286-6714	<u>Degree:</u> Ph.D., Physics, 1974 <u>Specialty:</u> Plasma Spectroscopy <u>Assigned:</u> AL
Dr. Keith C. Hanson Professor Lamar University Chemistry Department Beaumont, TX 77710 (713) 838-8267	<u>Degree:</u> Ph.D., Chemistry, 1967 <u>Specialty:</u> Organic Chemistry, Measurement of Physical Properties <u>Assigned:</u> FJSRL
Dr. Donald J. Healy Assistant Professor Georgia Institute of Technology Electrical Engineering Department Atlanta, GA 30332 (404) 894-2923	<u>Degree:</u> Ph.D., Electrical Engineering, 1981 <u>Specialty:</u> Image Processing (Communications) <u>Assigned:</u> AD
Prof. Ervin Hindin Professor Washington State University Civil & Environmental Engineering Dept. Pullman, WA 99164 (509) 335-7028	<u>Degree:</u> M.S., Environmental Chemistry, 1956 <u>Specialty:</u> Aquatic Chemistry, Water Supply Systems <u>Assigned:</u> ESC
Dr. Manuel A. Huerta Associate Professor University of Miami Physics Department Coral Gables, FL 33124 (305) 284-2323	<u>Degree:</u> Ph.D., Physics, 1970 <u>Specialty:</u> Plasma Physics, Fluid Mechanics, Electromagnetic Theory <u>Assigned:</u> AD
Dr. Francis J. Jankowski Professor Wright State University Engineering Department Dayton, OH 45435 (513) 873-2097	<u>Degree:</u> Sc.D., Physics, 1949 <u>Specialty:</u> Systems Engineering, Nuclear Engineering, Mechanical Engineering, Human Factors Engineering <u>Assigned:</u> WL

LIST OF PARTICIPANTS

Page 7

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Eric R. Johnson Assistant Professor Virginia Tech. Aerospace & Ocean Engineering Dept. Blacksburg, VA 24061 (703) 961-6699	<u>Degree:</u> Ph.D., Applied Mechanics, 1976 <u>Specialty:</u> Structural Stability & Composite Structures <u>Assigned:</u> FDL
Dr. James J. Kane Associate Professor Wright State University Chemistry Department Dayton, OH 45435 (513) 873-2352	<u>Degree:</u> Ph.D., Organic Chemistry, 1960 <u>Specialty:</u> Organic Chemistry Polymer Chemistry <u>Assigned:</u> ML
Dr. Samuel G. Kelly Assistant Professor University of Notre Dame Aerospace & Mechanical Engineering Dept. Notre Dame, IN 46556 (219) 239-7678	<u>Degree:</u> Ph.D., Engineering Mechanics, 1979 <u>Specialty:</u> Nonlinear Mechanics <u>Assigned:</u> FDL
Dr. Dennis M. Kern Assistant Professor University of Georgia Statistics & Computer Science Dept. Athens, GA 30602 (404) 542-2911	<u>Degree:</u> Ph.D., Statistics, 1976 <u>Specialty:</u> Microprocessors <u>Assigned:</u> SAM
Dr. Stuart T. Klapp Professor California State University Psychology Department Hayward, CA 94542 (415) 881-3484	<u>Degree:</u> Ph.D., Experimental Psychology, 1969 <u>Specialty:</u> Cognition and Human Performance <u>Assigned:</u> HRL/WP
Dr. Jerome Knopp Assistant Professor University of Missouri-Rolla Electrical Engineering Department Rolla, MO 65401 (314) 341-45439	<u>Degree:</u> Ph.D., Electrical Engineering <u>Specialty:</u> Electro-Optics <u>Assigned:</u> RADC/Griffiss
Dr. Keith Koenig Assistant Professor Mississippi State University Aerospace Engineering Department Mississippi State, MS 39762 (601) 323-3623	<u>Degree:</u> Ph.D., Aeronautics, 1978 <u>Specialty:</u> Laser Velocimetry, Separated Flow <u>Assigned:</u> AD

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Letitia J. Korbly Assistant Professor University of Alabama Mathematics Department Birmingham, AL 35294 (205) 934-2154	<u>Degree:</u> Ph.D., Mathematics, 1976 <u>Specialty:</u> Applied Math, Partial Differential Equations <u>Assigned:</u> WL
Dr. Philip Langer Associate Professor University of Colorado Ed. Psychology Department Boulder, CO 80309 (303) 492-8748	<u>Degree:</u> Ph.D., Education/Psychology, 1957 <u>Specialty:</u> Instructional Systems <u>Assigned:</u> JRL/L
Dr. Stephen F. Lin Associate Professor North Carolina Central University Chemistry Department Durham, NC 27707 (919) 683-6463	<u>Degree:</u> Ph.D., Physical Chemistry, 1970 <u>Specialty:</u> Physical Chemistry <u>Assigned:</u> RPL
Dr. Michael L. Lobb Assistant Professor University of Texas Graduate School of Social Work Arlington, TX 76019-0129 (817) 273-2707	<u>Degree:</u> Ph.D., Psychology, 1978 <u>Specialty:</u> Statistics and Experimental Design <u>Assigned:</u> SAM
Dr. D. J. Medeiros Assistant Professor Penn State University Industrial Engineering Department University Park, PA 16802 (814) 863-2364	<u>Degree:</u> Ph.D., Industrial Engineering, 1981 <u>Specialty:</u> Scheduling, Computer Simulation of Production/ Manufacturing Systems <u>Assigned:</u> ML
Dr. Thomas M. Miller Associate Professor University of Oklahoma Physics and Astronomy Department Norman, OK 70319 (405) 325-3961	<u>Degree:</u> Ph.D., Physics, 1968 <u>Specialty:</u> Experimental Atomic Collisions <u>Assigned:</u> GL
Dr. Michael J. Moloney Professor Rose-Hulman Institute of Technology Physics Department Terre Haute, IN 47803 (812) 877-1511	<u>Degree:</u> Ph.D., Physics, 1966 <u>Specialty:</u> Solid State Electronic Devices, Modern Physics <u>Assigned:</u> AL

LIST OF PARTICIPANTS

Page 1

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Luigi Morino Professor Boston University Aerospace & Mechanical Engineering Dept. Boston, MA 02215 (617) 353-3069	<u>Degree:</u> Ph.D., Aerospace Engineering, 1966, Ph.D., Mechanical Engineering, 1963 <u>Specialty:</u> Unsteady Aerodynamics and Structural Dynamics <u>Assigned:</u> AD
Dr. David S. Moroi Professor Kent State University Physics Department Kent, OH 44242 (216) 672-2596	<u>Degree:</u> Ph.D., Atomic Physics, 1959 <u>Specialty:</u> Atomic Physics, Transport Phenomena in Liquid Crystals <u>Assigned:</u> ML
Dr. H. Troy Nagle, Jr. Professor Auburn University Electrical Engineering Department Auburn, AL 36849 (205) 826-4330	<u>Degree:</u> Ph.D., Electrical Engineering, 1968 <u>Specialty:</u> Computer Engineering <u>Assigned:</u> SAM
Dr. Eugene M. Norris Associate Professor George Mason University Mathematical Science Department Fairfax, VA 22030 (703) 323-2262	<u>Degree:</u> Ph.D., Mathematics, 1969 <u>Specialty:</u> Theoretical Computer Science <u>Assigned:</u> AL
Dr. Thomas H. Ortmeyer Assistant Professor Clarkson College Electrical Engineering Department Potsdam, NY 13676 (315) 268-6536	<u>Degree:</u> Ph.D., Electrical Engineering, 1980 <u>Specialty:</u> Electric Machinery and Power Systems <u>Assigned:</u> APL
Dr. Dean H. Owen Associate Professor Ohio State University Psychology Department Columbus, OH 43210 (614) 422-7641	<u>Degree:</u> Ph.D., Experimental Psychology, 1965 <u>Specialty:</u> Perception, Psychophysics, Flight Simulation <u>Assigned:</u> HRL/Williams
Dr. Charles K. Parsons Assistant Professor Georgia Institute of Technology College of Management Atlanta, GA 30332 (404) 894-2619	<u>Degree:</u> Ph.D., Psychology, 1980 <u>Specialty:</u> Item Response Theory <u>Assigned:</u> HRL/Brooks

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Surgounda A. Patil Professor Tennessee Technical University Math & Computer Science Department Cookville, TN 38501 (615) 528-3593	<u>Degree:</u> Ph.D., Statistics, 1966 <u>Specialty:</u> Statistical Problems Applicable to Engineering and Environment <u>Assigned:</u> WL
Dr. Lakhpatt R. Pujara Associate Professor Wilberforce University Engineering/Mathematics Department Wilberforce, OH 45384 (513) 376-2911	<u>Degree:</u> Ph.D., Mathematics, 1971 M.S., Systems Engineering, 1981 <u>Specialty:</u> Control Systems <u>Assigned:</u> FDL
Dr. Zahir Qureshi Assistant Professor Rust College Biology Department Holly Springs, MS 36835 (601) 252-4661	<u>Degree:</u> Ed.D., Biochemistry, 1975 <u>Specialty:</u> Biochemistry Education <u>Assigned:</u> AMRL
Dr. Ronald L. Remke Assistant Professor University of South Florida Electrical Engineering Department Tampa, FL 33620 (813) 974-2581	<u>Degree:</u> Ph.D., Electrical Engineering, 1977 <u>Specialty:</u> Electronic Devices, Materials, and Processes/ Thin Films <u>Assigned:</u> RADC/Griffiss
Dr. Richard W. Rice Assistant Professor Clemson University Chemical Engineering Department Clemson, SC 29631 (803) 656-3055	<u>Degree:</u> Ph.D., Chemical Engineering, 1972 <u>Specialty:</u> Catalysis, Chemical Kinetics <u>Assigned:</u> ESC
Dr. Gerhard X. Ritter Associate Professor University of Florida Math & Computer Science Department Gainesville, FL 32611 (904) 392-4988	<u>Degree:</u> Ph.D., Mathematics, 1971 <u>Specialty:</u> Pattern Recognition, Applied Mathematics <u>Assigned:</u> AD
Dr. John M. Russell Assistant Professor University of Oklahoma School of Aero. Mech. and Nuclear Eng. Norman, OK 70319 (405) 325-5011	<u>Degree:</u> Ph.D., Fluid Mechanics, 1981 <u>Specialty:</u> Incompressible Flows, Boundary Layers, Stability, Turbulence <u>Assigned:</u> FDL

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Sarwan S. Sandhu Assistant Professor University of Dayton Chemical Engineering Department Dayton, OH 45469 (513) 229-2627	<u>Degree:</u> Ph.D., Combustion, 1973 <u>Specialty:</u> Combustion <u>Assigned:</u> APL
Dr. Robert E. Schlegel Assistant Professor University of Oklahoma Industrial Engineering Department Norman, OK 70319 (405) 325-3721	<u>Degree:</u> Industrial Engineering, 1980 <u>Specialty:</u> Human Factors <u>Assigned:</u> SAM
Dr. Eugene P. Schram Associate Professor Ohio State University Chemistry Department Columbus, OH 43210 (614) 222-1487	<u>Degree:</u> Ph.D. Inorganic Chemistry <u>Specialty:</u> Organometallic Chemistry <u>Assigned:</u> AL
Dr. K. Sam. Shanmugan Associate Professor University of Kansas Electrical Engineering Department Lawrence, KS 66045 (913) 864-4832	<u>Degree:</u> Ph.D. <u>Specialty:</u> Communication Systems Engineering <u>Assigned:</u> RADC/Griffiss
Dr. Trilochan Singh Associate Professor Wayne State University Mechanical Engineering Department Detroit, MI 48202 (313) 577-3845	<u>Degree:</u> Ph.D. Mechanical Engineering, 1970 <u>Specialty:</u> Combustion, Heat Transfer, Energy Conservation <u>Assigned:</u> APL
Dr. Boghos D. Sivazlian Professor University of Florida Industrial & Systems Engineering Dept. Gainesville, FL 32611 (904) 392-1464	<u>Degree:</u> Ph.D., Operations Research, 1966 <u>Specialty:</u> Operations Research, Math. Modeling, Military Problems <u>Assigned:</u> AD
Dr. Stanley L. Spiegel Assistant Professor University of Lowell Mathematics Department Lowell, MA 01854 (617) 738-5000	<u>Degree:</u> Ph.D., Physics, 1966 <u>Specialty:</u> Numerical Modeling and Computer Simulation of Geophysical Problems <u>Assigned:</u> GL

LIST OF PARTICIPANTS

Page 12

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Alexander P. Stone Professor University of New Mexico Mathematics Department Albuquerque, NM 87131 (505) 277-4643	<u>Degree:</u> Ph.D., Mathematics, 1965 <u>Specialty:</u> Differential Equations, Differential Geometry <u>Assigned:</u> WL
Dr. Alfred G. Striz Assistant Professor University of Oklahoma Aero Mechanical Nuclear Eng. Dept. Norman, OK 70319 (405) 325-5011	<u>Degree:</u> Ph.D., Aeronautics and Astronautics, 1981 <u>Specialty:</u> Aeroelasticity, Finite Elements, Aerospace Structure <u>Assigned:</u> AD
Dr. Patrick J. Sweeney Associate Professor University of Dayton Engineering Management Department Dayton, OH 45469 (513) 229-2238	<u>Degree:</u> Ph.D., Mechanical Engineering, 1977 <u>Specialty:</u> Simulation, O.R., Management <u>Assigned:</u> AMRL
Dr. Richard H. Tipping Professor University of Nebraska Physics Department Omaha, NE 68182 (402) 554-2510	<u>Degree:</u> Ph.D., Physics, 1969 <u>Specialty:</u> Molecular Spectroscopy, Atmospheric Physics <u>Assigned:</u> GL
Dr. Edward A. Walters Associate Professor University of New Mexico Chemistry Department Albuquerque, NM 87131 (505) 277-5239	<u>Degree:</u> Ph.D., Chemistry, 1966 <u>Specialty:</u> Physical Chemistry <u>Assigned:</u> WL
Dr. Kai Wang Associate Professor Wayne State University Mathematics Department Detroit, MI 48202 (313) 577-3193	<u>Degree:</u> Ph.D., Mathematics, 1972 <u>Specialty:</u> Spectral of graphs, Group Matrices <u>Assigned:</u> APL
Dr. Edward R. Ward, Jr. Associate Professor Alabama A & M University Biology Department Normal, AL 35762 (205) 859-7268	<u>Degree:</u> Ph.D., Microbiology, 1975 <u>Specialty:</u> Pathogenic Microbiology, Immunology <u>Assigned:</u> SAM

LIST OF PARTICIPANTS

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NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Thomas E. Webb Professor Ohio State University Physiological Chemistry Department Columbus, OH 43210 (614) 422-0103	<u>Degree:</u> Ph.D., Biochemistry, 1961 <u>Specialty:</u> Biochemistry, Molecular Biology, Carcinogenesis <u>Assigned:</u> AMRL
Prof. David Weimer Associate Professor Ohio Northern University Physics Department Ada, OH 45810 (419) 634-9921	<u>Degree:</u> M.S., Physics, 1946 <u>Specialty:</u> Gas dynamics, Shock Wave Phenomena, Electrooptical Effects and Instrumentation <u>Assigned:</u> APL
Dr. Thomas A. Wiggins Professor Penn State University Physics Department University Park, PA 16802 (814) 865-5233	<u>Degree:</u> Ph.D., Physics, 1980 <u>Specialty:</u> Physical Optics, Molecular Spectra <u>Assigned:</u> FJSRL
Dr. David H. Williams Assistant Professor University of Texas Electrical Engineering Department El Paso, TX 79968 (915) 747-5470	<u>Degree:</u> Ph.D., Electrical Engineering, 1977 <u>Specialty:</u> Computer Graphics <u>Assigned:</u> WL
Dr. Robert E. Willis Assistant Professor Mercer University Physics Department Macon, GA 31207 (912) 744-2704	<u>Degree:</u> Ph.D., Physics, 1979 <u>Specialty:</u> Microwave Spectroscopy <u>Assigned:</u> AEDC
Dr. David C. Wilson Associate Professor University of Florida Mathematics Department Gainesville, FL 32611 (904) 392-6035	<u>Degree:</u> Ph.D., Mathematics, 1969 <u>Specialty:</u> Dimension Theory <u>Assigned:</u> FDL
Dr. Rama K. Yedavalli Assistant Professor Stevens Institute of Technology Mechanical Engineering Department Hoboken, NJ 07030 (201) 420-5574	<u>Degree:</u> Ph.D., Aerospace Engineering, 1981 <u>Specialty:</u> Sensitivity Theory for Linear Multivariable Optimal Control Systems <u>Assigned:</u> FDL

PARTICIPANT LABORATORY ASSIGNMENT

1982 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

AERO PROPULSION LABORATORY

(Wright-Patterson Air Force Base)

1. Dr. Eugene Brown - Virginia Polytechnic Institute & State University
2. Dr. Jimmie Cathey - University of Kentucky
3. Dr. Dennis Flentge - Cedarville College
4. Dr. Thomas Ortmeyer - Clarkson College
5. Dr. Sarwan Sandhu - University of Dayton
6. Dr. Kai Wang - Wayne State University
7. Prof. David Weimer - Ohio Northern University

AEROSPACE MEDICAL RESEARCH LABORATORY

(Wright-Patterson Air Force Base)

1. Dr. Terry Bahill - Carnegie-Mellon University
2. Dr. Louis Buckalew - Alabama A&M University
3. Dr. Gregory Corso - Georgia Institute of Technology
4. Dr. Andris Freivalds - Pennsylvania State University
5. Dr. Zahir Quershi - Rust College
6. Dr. Patrick Sweeney - University of Dayton
7. Dr. Thomas Webb - Ohio State University

ARMAMENT DIVISION

(Eglin Air Force Base)

1. Dr. Donald Healy - Georgia Institute of Technology
2. Dr. Manuel Huerta - University of Miami
3. Dr. Keith Koenig - Mississippi State University
4. Dr. Luigi Morino - Boston University
5. Dr. Gerhard Ritter - University of Florida
6. Dr. Boghos Sivazlian - University of Florida
7. Dr. Alfred Striz - University of Oklahoma

ARNOLD ENGINEERING DEVELOPMENT CENTER

(Arnold Air Force Station)

1. Dr. Larry Forney - Georgia Institute of Technology
2. Dr. Robert Willis - Mercer University

AVIONICS LABORATORY

(Wright-Patterson Air Force Base)

1. Dr. Jack Bourquin - University of Missouri
2. Dr. Albert Frasca - Wittenberg University
3. Dr. Ronald Greene - University of New Orleans
4. Dr. Michael Moloney - Rose-Hulman Institute of Technology
5. Dr. Eugene Norris - George Mason University
6. Dr. Eugene Schram - Ohio State University

BUSINESS RESEARCH MANAGEMENT CENTER

(Wright-Patterson Air Force Base)

1. Dr. David Cleeton - Oberlin College
2. Dr. Hamed Eldin - Oklahoma State University

PARTICIPANT LABORATORY ASSIGNMENT (Continued)

EASTERN SPACE & MISSILE CENTER

(Patrick Air Force Base)

1. Dr. Junho Choi - Florida Institute of Technology

ELECTRONICS SYSTEMS DIVISION

(Hanscom Air Force Base)

1. Dr. Wilford Fordon - Michigan Technological University

ENGINEERING & SERVICES CENTER

(Tyndall Air Force Base)

1. Dr. Muluneh Azene - Southern University
2. Dr. Robert Douglas - North Carolina State University
3. Dr. Fernando Fagundo - University of Florida
4. Prof. Ervin Hindin - Washington State University
5. Dr. Richard Rice - Clemson University

FLIGHT DYNAMICS LABORATORY

(Wright-Patterson Air Force Base)

1. Dr. Eric Johnson - Virginia Polytechnic Institute & State University
2. Dr. Samuel Kelly - University of Notre Dame
3. Dr. Lakhpat Pujara - Wilberforce University
4. Dr. John Russell - University of Oklahoma
5. Dr. David Wilson - University of Florida
6. Dr. Rama Yedavalli - Stevens Institute of Technology

FRANK J. SEILER RESEARCH LABORATORY

(USAF Academy)

1. Dr. Keith Hanson - Lamar University
2. Dr. Thomas Wiggins - Pennsylvania State University

GEOPHYSICS LABORATORY

(Hanscom Air Force Base)

1. Dr. Francesco Bacchialoni - University of Lowell
2. Dr. Pradip Bakshi - Boston College
3. Dr. Thomas Miller - University of Oklahoma
4. Dr. Stanley Spiegel - University of Lowell
5. Dr. Richard Tipping - University of Nebraska

HUMAN RESOURCES LABORATORY/ADVANCED SYSTEMS DIVISION

(Wright-Patterson Air Force Base)

1. Dr. Mason Bailey - Western Carolina University
2. Dr. Stewart Klapp - California State University

HUMAN RESOURCES LABORATORY/FLYING TRAINING DIVISION

(Williams Air Force Base)

1. Dr. Eugene Galluscio - Northwest Missouri State University
2. Dr. Dean Owen - Ohio State University

PARTICIPANT LABORATORY ASSIGNMENTS (Continued)

HUMAN RESOURCES LABORATORY/PERSONAL RESEARCH DIVISION
(Brooks Air Force Base)

1. Dr. Gary Allen - Old Dominion University
2. Dr. Charles Parsons - Georgia Institute of Technology

HUMAN RESOURCES LABORATORY/TECHNICAL TRAINING DIVISION
(Lowry Air Force Base)

1. Dr. Philip Langer - University of Colorado

LEADERSHIP & MANAGEMENT DEVELOPMENT CENTER
(Maxwell Air Force Base)

1. Dr. Hubert Feild - Auburn University

LOGISTICS COMMAND
(Wright-Patterson Air Force Base)

1. Dr. Donald Byrkett - Miami University

LOGISTICS MANAGEMENT CENTER
(Gunter Air Force Base)

1. Dr. Milton Alexander - Auburn University

MATERIALS LABORATORY
(Wright-Patterson Air Force Base)

1. Dr. Gust Bambakidis - Wright State University
2. Dr. Sherman Brown - University of Illinois
3. Dr. Mark Fugelso - Pennsylvania State University
4. Dr. James Kane - Wright State University
5. Dr. Deborah Medeiros - Pennsylvania State University
6. Dr. David Moroi - Kent State University

ROCKET PROPULSION LABORATORY
(Edwards Air Force Base)

1. Dr. Stephen Lin - North Carolina Central University
2. Dr. Trilochan Singh - Wayne State University

ROME AIR DEVELOPMENT CENTER
(Griffiss Air Force Base)

1. Dr. Richard Absher - University of Vermont
2. Dr. Roger Cavallo - State University of New York
3. Dr. Jerome Knopp - University of Missouri/Rolla
4. Dr. Ronald Remke - University of South Florida
5. Dr. Sam Shanmugan - University of Kansas

ROME AIR DEVELOPMENT CENTER/ELECTRONICS TECHNOLOGY
(Hanscom Air Force Base)

1. Dr. Albert Biggs - University of Kansas
2. Dr. William Filippone - University of Arizona

PARTICIPANT LABORATORY ASSIGNMENT (Continued)

SCHOOL OF AEROSPACE MEDICINE

(Brooks Air Force Base)

1. Dr. Silverio Almeida - Virginia Polytechnic Institute and State University
2. Dr. Willie Bragg - University of Cincinnati
3. Dr. John Enderle - North Dakota State University
4. Dr. Mack Felton - Southern University
5. Dr. Dennis Kern - University of Georgia
6. Dr. Michael Lobb - University of Texas
7. Dr. Troy Nagle - Auburn University
8. Dr. Robert Schlegel - University of Oklahoma
9. Dr. Edward Ward - Alabama A&M University

WEAPONS LABORATORY

(Kirtland Air Force Base)

1. Dr. Francis Jankowski - Wright State University
2. Dr. Letitia Korbly - University of Alabama
3. Dr. Surgounda Patil - Tennessee Technological University
4. Dr. Alexander Stone - University of New Mexico
5. Dr. Edward Walters - University of New Mexico
6. Dr. David Williams - University of Texas

APPENDIX II

- 1. Listing of Research Reports Submitted in the
1982 Summer Faculty Research Program**
- 2. Abstracts of the 1982 Associate's Research Reports**

RESEARCH REPORTS
1982 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

<u>Volume I Report Number</u>	<u>Title</u>	<u>Research Associate</u>
1	Sensitivity Based Segmentation And Identification In Automatic Speech Recognition	Prof. Richard G. Absher
2	A Methodology For The Determination Of Input Date Accuracy In The Maintenance Data Collection System	Dr. Milton J. Alexander
3	Assessment of Visuospatial Abilities Using Complex Cognitive Tasks	Dr. Gary L. Allen
4	The Effect Of Modulation Transfer Functions On Flashblindness	Dr. Silverio P. Almeida
5	A Theoretical Evaluation Of The Airfield Pavement Analysis (AFPAV) Finite Element Model	Dr. M. Azene
6	Orbiting Geophysics Laboratory Experiment	Dr. Francesco L. Bacchialoni
7	Trials And Tribulations At The Helmet Mounted Oculomotor Facility	Dr. A. Terry Bahill
8	Feasibility Of Computer Graphics As An Aid To Aircraft Battle Damage Assessment	Dr. M. Gene Bailey
9	Effects Of Magnetic Shear On Lower Hybrid Waves In The Supraauroral Region	Dr. Pradip M. Bakshi
10	A Simple Model For Impurity Photo- Absorption In Silicon	Dr. Gust Bambakidis
11	Feasibility And Implementation Of A Near Field Antenna Range	Prof. Albert W. Biggs
12	Computer Simulation Of Channelized Receivers	Dr. Jack J. Bourquin
13	From Petite Aviatrix To USAF Aircrew: Historical Review And Current Status Of Female Fliers	Dr. Willie A. Bragg

<u>Report Number</u>	<u>Title</u>	<u>Research Associate</u>
14	Navier-Stokes Solvers For Ramjet Applications	Dr. Eugene F. Brown
15	Development Of Measurment Technique For Fiber-Matrix Adherence In Brittle-Brittle Composites	Dr. S. D. Brown
16	Force Tracking Proficiency In Operating Aircraft Controls	Dr. L. W. Buckalew
17	Spares Support Using Cannibalization	Dr. Donald L. Byrnett
18	Electrically Compensated Constant Speed Drive	Dr. Jimmie J. Cathey
19	An Expert System For Systems Research In Command And Control	Dr. Roger E. Cavallo
20	Adaptive Kalman Tracking Filter for ARIS System	Dr. Junho Choi
21	Incentive Contracting In Multi-Year Procurement	Dr. David Cleeton
22	Binary Classification And The Subtractive Approach	Dr. Gregory M. Corso
23	Evaluation Of The Non-Destructive Testing Of Airfield Pavements: Wave Propagation Aspects	Dr. Robert A. Douglas
24	AMIS - Acquisition Management Information System Problems And Promises	Dr. Hamed Kamal Eldin
25	Modeling And Tracking Saccadic Eye Movements	Dr. John D. Enderle
26	Dynamic Response Of Doubly Curved Cylindrical Shelter	Dr. Fernando E. Fagundo,
27	Using Hard Criteria To Evaluate Leadership And Management Development Center Consultations	Dr. Hubert S. Feild

<u>Report Number</u>	<u>Title</u>	<u>Research Associate</u>
28	An Evaluation Of Indices Of Coronary Heart Disease (CHD) In A Diseased Free Population	Dr. Mack Felton, Jr.
29	Electron Transport Calculations Using The Method Of Streaming Rays	Dr. W. L. Filippone
30	Voltammetric Studies Of The Lithium/Vanadium Oxide Electrochemical Cell	Dr. Dennis R. Flentge
31	Integral Principles As Applied To Electromagnetic Propagation	Dr. Wilfred A. Fordon
32	Scaling Laws For Particle Breakup In Nozzle Generated Shocks	Dr. L. J. Forney
33	Oxygen-18 Implantation In GaAs	Dr. Albert J. Frasca
34	Modeling Of Active Neuromusculature Response To Mechanical Stress	Dr. Andris Freivalds
35	The Manufacturing Control Language For Robotic Work Cell	Dr. Mark A. Fugelso
36	Parafoveal Visual Information Processing As A Secondary Task Load	Prof. Eugene H. Galluscio
37	Three-Dimensional Visual Information Processing With Binocular Helmet-Mounted Displays	Prof. Eugene H. Galluscio
38	Shallow Donor And Exciton Binding Energies in Quantum Wells	Dr. Ronald L. Greene
39	Nitro Organic Compounds: A Synthetic Study	Dr. Keith Hansen
40	The Effect Of Certain Image Data Reduction Techniques On Edge Quality	Dr. Donald J. Healy
41	Evaluation Of Gas Chromatographic Methods For Determining Trace Levels Of Trichloroethylene In Water	Prof. Ervin Hindin

<u>Report Number</u>	<u>Title</u>	<u>Research Associate</u>
42	Basic Research Issues In Electromagnetic Rail Launchers With Plasma Driven Projectiles	Dr. Manuel A. Huerta
43	Operational Safety Review Methodology	Dr. Francis J. Jankowski
44	Modeling Localized Stress Fields In Composite Laminates	Dr. Eric R. Johnson
45	Synthesis Of Acetylene Terminated Sulfone (ATS) Candidates	Dr. James J. Kane
46	Mathematical Formulation Of The Shear Layer Over An Open Cavity	Dr. Samuel G. Kelly, III
47	Automating The Numerical Stereo Camera	Dr. Dennis M. Kern
48	Memory And Processing Limits In Decision Making	Dr. Stuart T. Klapp
49	Analysis And Modeling Of A Real- Time Holography System	Dr. Jerome Knopp
Volume II		
50	Numerical Solution Of The Three- Dimensional, Unsteady Euler Equation	Dr. Keith Koenig
51	Displaying Results From Numerical Calculations Using Computer Graphics	Dr. Letitia Korbly
52	Modification Of Current Feedback Strategies: A Text Synthesis Approach	Dr. Philip Langer
53	The Detection Of Hazardous Materials From Spills	Dr. Stephen F. Lin
54	Tentative Identification Awareness Stages Leading To Failure Of Vigilance	Dr. Michael L. Lobb
55	Order Release In An MRP Environment	Dr. D. J. Medeiros

<u>Report Number</u>	<u>Title</u>	<u>Research Associate</u>
56	The Measurement Of Ion-Molecule Reaction Rate Coefficients	Dr. Thomas M. Miller
57	A GaAs FET Computer Model With Applications To Magnetic Field Effects	Dr. Michael J. Moloney
58	Flutter Taming By Nonlinear Active Control	Dr. Luigi Morino
59	A Theory Of Photoluminescence For Excitons Bound To Two Types Of Neutral Acceptors In Silicon- A Study Of The Systems Si: (In, A ₀) and Si: (In, B)	Dr. David S. Moroi
60	Error Analysis Of The Karhunen- Loeve Transform In VCG Signal Processing	Dr. H. Troy Nagle, Jr.
61	Simulation Of Adaptive Networks Based On Rest Principle And Heterostatic Models	Dr. Eugene M. Norris
62	Aircraft Electric Power Generation Using Cascaded Symmetrically Wound Machines	Dr. Thomas H. Ortmeier
63	Adaptation To Optical Flow Rates During Low Altitude, High Speed Flight	Dr. Dean H. Owen
64	The Robustness Of Unidimensional Item Response Theory Models	Dr. Charles K. Parsons
65	R-Reliable Intervals For The Sum Of Two Independent Normal Or Random Variables	Dr. S. A. Patil
66	Model Reduction Of Control Systems	Dr. L. R. Pujara
67	Measurement Of Levels Of Prostaglandin-E And Prostaglandin-F _{2α} In Various Tissues, Urine, and Plasma Of Rats Given Nonadecafluorodecanoic Acid	Dr. Zahir Qureshi

<u>Report Number</u>	<u>Title</u>	<u>Research Associate</u>
68	A Preliminary Study Of Electromigration In Aluminum And Aluminum-Silicon Films	Dr. R. L. Remke
69	A Study Of Factors Affecting Soot Formation In A Swirl - Stabilized Combustor	Dr. Richard W. Rice
70	Development Of A Mathematical Foundation For Cellular Image Processing	Dr. Gerhard X. Ritter
71	Turbulent Boundary Layers Over Rough Surfaces In Hypersonic Flow	Dr. John M. Russell
72	Conceptualization Of The Dynamic Behavior Of The Flow-Field In The APL Combustor	Dr. Sarwan S. Sandhu
73	Performance Demand And CNS Depressant Stressor Effects On Spatial Orientation Information Processing	Dr. Robert E. Schlegel
74	Metal Organic Chemical Vapor Deposition-Evaluation Of Current And Possible Future Chemical Systems As Related To The Formation Of Gallium Arsenide	Dr. Eugene P. Schram
75	Software Simulation Requirements For The CVA Program And Other Applications	Dr. K. Sam Shanmugan
76	Afterburning Suppression Kinetics In Rocket Exhaust	Dr. Trilochan Singh
77	On Estimating Probability Of Kill In Weapon Evaluation	Dr. B. D. Sivazlian
78	Methods For Computation Of Certain Diagnostics For The AFGL General Circulation Model	Dr. Stanley L. Spiegel
79	A Differential Geometric Approach To Electromagnetic Lens Design	Dr. Alexander P. Stone
80	The Use Of Experimental Input In Transonic Aerodynamics	Dr. Alfred G. Striz

<u>Report Number</u>	<u>Title</u>	<u>Research Associate</u>
81	A Dynamic Model Of Acceleration Stress Protection IN The Human Aircrew Member	Dr. Patrick J. Sweeney
82	Collision-Induced Absorption In The Far Infrared Spectrum of N ₂	Dr. Richard H. Tipping
83	Photoionization Of Iodine Molecules And Clusters In A Supersonic Molecular Beam	Dr. Edward A. Walters
84	Data Communications Between CDC Cyber 750 and HP 1000	Dr. Kai Wang
85	Isolation Of Pyrogenic Exotoxin C From Staphylococcus Aureus Strains Associated With Toxic- Shock Syndrome	Dr. Edward R. Ward, Jr.
86	Effect Of NDFDA On Fatty Acid Synthesis In Rat Liver	Dr. Thomas E. Webb
87	Hook Interferometry Using A Pulsed Dye Laser	Prof. David Weimer
88	Laser Damage In Films And Plastics	Dr. T. A. Wiggins
89	An Algorithm And Associated Data Structures For Hidden Surface Elimination	Dr. David H. Williams
90	Effort To Produce Metaboric Acid Vapor And Water Vapor Broadening Of Carbon Monoxide Absorption Lines	Dr. Robert E. Willis
91	3-Dimensional Grid Generation With Applications To High Performance Aircraft	Dr. David C. Wilson
92	Time Domain Analysis And Synthesis Of Robust Controllers For Large Scale LQG Regulators	Dr. Rama K. Yedavalli

SENSITIVITY BASED SEGMENTATION AND IDENTIFICATION
IN AUTOMATIC SPEECH RECOGNITION

by

Dr. Richard G. Absher

ABSTRACT

A sensitivity analysis for the segmentation and identification of the phonetic units of speech was investigated. Elements of the sensitivity matrix, which express the relative change in each pole of the speech model to a relative change in each coefficient of the characteristic equation, was evaluated for each of the fifteen vowels for a single male speaker. It was found that the sensitivity matrix provides (1) a measure of the degree to which a vowel is "on target", (2) a categorical indicator for the group of front vowels, (3) a categorical indicator for the group of back vowels, and (4) may provide sufficient information to identify each particular vowel. Suggestions for further research in this area are offered.

A METHODOLOGY FOR
THE DETERMINATION OF INPUT DATA ACCURACY
IN THE MAINTENANCE DATA COLLECTION SYSTEM

by

Milton J. Alexander

ABSTRACT

A methodology for the determination of input data accuracy in the maintenance data collection system is developed. The level of input data accuracy is subject to two different types of errors - data which should have been entered into the MDCS but was not (Class A errors) and erroneous data which was entered into the MDCS (Class B errors). The survey instrument which was developed provides a measure of Class A errors and three different types of Class B errors. A sampling plan was developed which will produce a random sample having a confidence level of 95 percent with minimal bias. A Statistical Package for the Social Sciences (SPSS) subprogram was prepared for the tabulation and analysis of the raw survey data. A recommendation for further study is also included.

ASSESSMENT OF VISUOSPATIAL ABILITIES USING COMPLEX COGNITIVE TASKS

by

Gary L. Allen

ABSTRACT

The focus of this research effort was on the identification of visuospatial cognitive abilities and the incorporation of these abilities into complex cognitive tasks for application in a testing context. The initial study involved determining the relationship between a battery of psychometric visuospatial tests and performance on a complex, visually presented macrospatial task. In the second study the relationship between psychometric memory tests and performance on a specially designed Maze Learning Task was examined. Results from these studies suggested the value of additional basic research concerned with the role of visuospatial abilities in human information processing and the acquisition of procedural knowledge.

THE EFFECT OF MODULATION TRANSFER FUNCTIONS
ON FLASHBLINDNESS

by

Silverio P. Almeida

ABSTRACT

The study of flashblindness is an important area of research since it can adversely effect normal vision. How an object is ultimately imaged through the visual cortex both under normal and flashblindness conditions is the subject of this study. It is believed by some researchers that image processing by humans and some primates is analogous to Fourier transform analysis. It is in this spirit that we investigated the possible effect of simulated flashblindness on various modulation transfer functions applied to an airplane instrument panel's Fourier transform. Preliminary results of this study are presented in this report. Also, further research is suggested for possible study.

A THEORETICAL EVALUATION OF THE AIRFIELD PAVEMENT

ANALYSIS (AFPAV) FINITE ELEMENT MODEL

by

M. AZENE

ABSTRACT

The theoretical basis of the finite element model used in the airfield pavement analysis (AFPAV) code is studied. The scope of the study is limited to the mathematical model and does not attempt to investigate the programming aspect of the computer code.

On the basis of the study concluded, the semianalytical model used in AFPAV was found to be unsuitable for nonlinear analysis. For linear analysis the model provides a viable analysis technique. However, for improved accuracy some aspects of the idealization scheme utilized in the code need modification.

Alternate finite element idealization concepts are presented and guidance for implementing them are discussed.

Finally, material property characterization models are reviewed and suggestions and recommendation for continued effort outlined.

ORBITING GEOPHYSICS LABORATORY EXPERIMENT

by

Francesco L. Bacchialoni

ABSTRACT

This document reports the investigation on the potential utility and technical feasibility of a new self-contained support system to be utilized repeatedly for different AFGL experiments in space, using the Space Transportation System (Shuttle) for launch and retrieval. This support system is designed to operate independently of both the STS and ground stations, therefore, stores data rather than transmitting them by telemetry. Angular pointing is the only maneuver planned; no propulsion is designed into this system.

TRIALS AND TRIBULATIONS AT THE HELMET MOUNTED OCULOMOTOR FACILITY

by

A. Terry Bahill & Jeffrey S. Kallman

ABSTRACT

We spent most of the summer debugging the Helmet Mounted Oculometer Facility (HMOF) equipment. On our last day we were finally able to gather data on human head and eye coordination. We brought this data back to Carnegie-Mellon University; we were able to put it on our computer system and analyze it with our programs.

FEASIBILITY OF COMPUTER GRAPHICS AS AN AID
TO AIRCRAFT BATTLE DAMAGE ASSESSMENT

by

M. Gene Bailey

ABSTRACT

The rapid and technically accurate assessment of the battle damage an aircraft has sustained is vital if our limited personnel and spare resources are to be used efficiently and effectively in a combat environment. Obviously, the capability to return damaged aircraft to a mission ready status has force multiplier implications. Rapid and accurate assessment is the first and perhaps the toughest aspect of the battle damage repair process.

The effort discussed in this paper was designed to determine the feasibility of developing a computer-based, portable graphics device to aid in the assessment of aircraft battle damage. Suggestions for future research are offered.

EFFECTS OF MAGNETIC SHEAR ON LOWER HYBRID WAVES
IN THE SUPRAURORAL REGION

by
Pradip M. Bakshi

ABSTRACT

Effects of magnetic shear on lower hybrid modes are investigated. It is shown that due to non-local effects, even a small shear can lead to a significant reduction of their growth rate. These results are of importance in the context of the recently proposed mechanism of lower hybrid acceleration and ion evolution in the supraauroral region. The non-local effects of magnetic shear are moderated if the width of the current sheet is not sufficiently large, and then the local growth rates are recovered.

A SIMPLE MODEL FOR IMPURITY PHOTO-ABSORPTION

IN SILICON

by

Gust Bambakidis

ABSTRACT

A simple model for absorption of infrared radiation by impurity atoms in silicon crystals has been developed and applied to electronic excitations of the Group V donors Bi, Sb, As and P, and the Group III acceptors B, Al, Ga and In. The model is based on the quantum-defect method for approximating bound donor or acceptor wave functions outside the core region of the impurity. For each donor species, the relative oscillator strengths have been calculated for the transitions from the ground state to the first four excited levels. For each acceptor species, the relative oscillator strengths were calculated for transitions from the $P_{3/2}$ ground state to the first three $P_{1/2}$ excited levels. Comparison with high-resolution absorption spectra show qualitative agreement for the low-lying transitions.

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FEASIBILITY AND IMPLEMENTATION OF A NEAR FIELD ANTENNA RANGE

by

Albert W. Biggs

ABSTRACT

Feasibility and implementation of a near field antenna range for large antenna arrays are investigated. The investigation also includes adaptive antenna arrays at near field ranges. Advantages and disadvantages of near field over direct far field antenna pattern measurements are compared. Descriptions of the basic theory of probe-compensated near field techniques and adaptive nulling are presented so that multiple usage of the near field range antenna arrays may be demonstrated.

COMPUTER SIMULATION OF CHANNELIZED RECEIVERS

by

Jack J. Bourquin

ABSTRACT

Development of computer subroutines applicable to the simulation of channelized receivers was continued. Some of the subroutines simulate the various blocks typical of a receiver, such as filters, detectors, and limiters. Others provide for diverse excitations, such as a pulse of CW carrier, or generate one of the types of displays available, such as the spectrogram of any signal in the system. The main (subroutine calling) program has a flow chart that closely resembles that of the system to be simulated.

Subroutines for several additional components were written and debugged. Progress was made toward converting the simulation package from FORTRAN IV to BASIC. Some of the subroutines were written in or converted to a modified simulation scheme whereby advantage is taken of the frequency characteristics of narrow band limited systems and of the cyclic properties of the discrete Fourier transform to greatly reduce computer memory requirements and running times. Thus, the simulation package was made more compatible to the desktop type of computer.

FROM PETITE AVIATRIX TO USAF AIRCREW: HISTORICAL REVIEW
AND CURRENT STATUS OF FEMALE FLIERS

by

Willie A. Bragg

ABSTRACT

A research project was conducted to investigate the integration of females into the United States Air Force. The focus of the investigation was to examine issues surrounding female entry into the undergraduate pilot training program. Historical data, attitudinal studies and policy guidelines are discussed as they relate to undergraduate pilot training. The results indicate that females have positively contributed to the field of aviation. In addition, female entries into undergraduate pilot training programs have increased. Recommendations for further research are outlined.

NAVIER-STOKES SOLVERS FOR RAMJET APPLICATIONS

by

Eugene F. Brown

ABSTRACT

A typical Navier-Stokes solver (STARRC) was run in an attempt to simulate measured velocity and turbulence intensity measurements in a sudden expansion (dump) combustor. Failure to accurately predict the measured centerline velocity suggested that the turbulence model used in the calculation may be inadequate at low Reynolds numbers. Modifications to the program which allow the calculation of combustion efficiency and combustor pressure loss are described. Suggestions are made for improving the program and for implementing extensions to it. These include: an improved turbulence model, a more realistic combustion model, a hybrid algorithm, and a method of solution for high speed compressible flows.

DEVELOPMENT OF A MEASUREMENT TECHNIQUE FOR
FIBER-MATRIX ADHERENCE IN BRITTLE-BRITTLE COMPOSITES

by

Dr. S. D. Brown

ABSTRACT

Experimental measurement of fiber-matrix adherence was surveyed in the context of ceramic-ceramic and ceramic-glass composites. A literature search, and several letters and telephone calls yielded eight kinds of tests that held some promise of being adaptable to the specific case. These are listed and some are described. Of the eight, all but two were eliminated from consideration. The reasons for their being eliminated are given. Attempts to prepare test specimens and prove out selected tests proved futile. Said attempts are discussed. Finally, recommendations for further work are made.

FORCE TRACKING PROFICIENCY IN
OPERATING AIRCRAFT CONTROLS

by

L. W. Buckalew

ABSTRACT

This project is associated with the Air Force Aerospace Medical Research Laboratory's Pilot Strength Screening Program. An overview of static and dynamic strength is provided, with emphasis on relation to aircraft maneuvers. Research objectives were to determine the maximum strength applied to a wheel-type elevator and aileron control and to establish the relationship between tracking proficiency and control force resistance at variable submaximal strength levels. Corollary measures of heart rate and EMG frequency shift and amplitude were taken. Data collection is ongoing. Anticipated results should allow comparison of a wheel and stick-configured control system in terms of applicable strength. Based on tracking proficiency, results should provide insight into minimum and maximum control apparatus force resistances associated with adequate aircraft control, and will have relevance for design specifications. Several related research problems were developed.

SPARES SUPPORT USING CANNIBALIZATION

by
Donald L. Byrkett

ABSTRACT

As an aircraft, weapon system, or other type of Air Force equipment reaches the latter phase of its life cycle there is a desire to spend less money in spares support due to the high risk of obsolescence. One approach to avoiding these expenditures is cannibalization, a process where several pieces of equipment are taken out of operation in order to provide spares support for the remaining pieces of equipment. This report describes the development of a mathematical model to predict the availability of equipment in the future where the sole means of support is cannibalization. This model is used to analyze data collected for the F-106 simulator. Suggestions for further extensions of the model are offered in the last section.

ELECTRICALLY COMPENSATED CONSTANT SPEED DRIVE

by

Jimmie J. Cathey

and

Tim W. Krimm

ABSTRACT

The feasibility of designing a constant speed drive utilizing a mechanical differential in conjunction with a parallel electric drive speed compensation link is examined. Bidirectional power flow in the electric compensation link uses two high-speed, permanent-magnet, three-phase machines interconnected by a power conditioning network. One machine is operated as a brushless dc machine, while the other functions as a variable speed synchronous machine. Steady-state performance of two types of power conditioning are studied--a dc link inverter and a cyclo-converter link.

The dc link inverter with bidirectional power flow is found to require excessive values of current to allow full range reverse power flow. A mode switch to synchronous inversion is necessary to reduce current values, but it adds the penalty of increase in power electronic devices and control complexity. The cycloconverter link is found to offer the better full range bidirectional power flow. In addition, a dc link system is examined for a method of operation with unidirectional power flow through the compensation link at the expense of increased size of electrical machines, but offering simpler controls.

Suggestions are made for further research on this system concept.

by
Roger E. Cavallo

ABSTRACT

This report describes the basic issues related to complex systems associated with Command and Control. Rather than start with Command and Control as such, the underlying assumption is that problems associated with the area are prototypical of those which are being studied in a fundamental way in the field of systems theory.

The objective is to outline an operational framework which, when implemented on a computer, will serve as an expert system to aid users:

- A. in characterizing and describing complex decision-making situations;
- B. in the development, evaluation, and use of complex organizational and technical products associated with these situations.

The perspective taken in this report is that of systems modelling, defined in terms of an organized framework for recognizing and solving a comprehensive collection of interrelated systems problems which represent attempts to determine new knowledge about an object of interest. In this paper, "object" refers to the actual situation being investigated, on which systems (which carry most of the sense of the word "model" as it is often used) are defined.

Sections of the paper present the following: a general rationale for a comprehensive framework for systems investigation; the overall framework; the development of one component of the framework in some detail; a brief description of a number of possible studies using the framework.

Adaptive Kalman Tracking Filter for ARIS System

by

Junho Choi

ABSTRACT

As an extension of the Metric Accuracy Improvement Program (MAIP) at the Eastern Test Range (ETR), Patrick Air Force Base (PAFB) in Florida, the adaptive technique has been developed and simulated for the possible application to the existing ARIS systems.

Sklansky's model has been adopted for the Kalman filter simulation study, since this model has been widely used in this area and has also produced more errors when the straight Gaussian statistics are applied to the model. The feasibility of adaptive technique has been studied to update the measurement, driving, and state error covariance statistics. Results show that both measurement and driving (or process) noise covariances are very sensitive to the overall performance of the filter.

Several areas for the additional and continuing work are suggested and recommended to achieve the goals successfully.

INCENTIVE CONTRACTING IN MULTI-YEAR PROCUREMENT

by

David L. Cleeton

ABSTRACT

Using agency theory, insurance theory and results from economic incentive contracting models, this paper examines optimal risk sharing arrangements in multi-year contracting. While past models of incentive contracting have focused entirely on cost monitoring and performance evaluation, this research also looks at uncertainty due to demand fluctuations. Several alternatives are offered to supplement linear cost sharing devices in addresssing the risk sharing and moral hazard problem. The results suggest that a more flexible bargaining position may be achieved by the government through the use of multi-year procurement and that this advantage can be used to more closely evaluate contract performance. Lastly, suggestions for further research are outlined. An extended version of this report is given in (3).

BINARY CLASSIFICATION AND THE SUBTRACTIVE APPROACH

by

Gregory M. Corso

ABSTRACT

Two experiments were performed using a modification of the subtractive approach to the partitioning of human reaction time. This investigation provided information concerning the effects of display load, classification rules, the proportion of target items, and interference stimuli on input and output latencies. The major findings from this investigation showed that input and output latencies were affected by different independent variables and provided information regarding the cognitive processes within a binary classification task not observed with previous methods. Suggestions for further research are presented.

EVALUATION OF THE NON-DESTRUCTIVE

TESTING OF AIRFIELD PAVEMENTS:

WAVE PROPAGATION ASPECTS

by

Robert A. Douglas

ABSTRACT

Two different systems are currently being developed for the non-destructive testing (NDT) of airfield pavements. The two systems are evaluated here from the standpoint of their data collection schemes and the hypotheses on which the initial data processing is based. It is found that each system has critical points where understanding of the physical phenomena and of the fundamental nature of the mathematical processing of experimental data is yet to be fully established. Such points are identified and suggestions made for their resolution and for continued system development.

Next, it is suggested that it would be useful for the AF to possess an additional NDT system capable of being easily transported to airfields with which the AF has no experience, to be able to predict, in a matter of hours, runway carrying capacity for near term use. Requirements, functional hypotheses and system elements are described.

Finally, it is recommended that (1) research be initiated to establish a firm basis for the near-source use of Rayleigh waves to determine properties of the multi-layered and slabbed solids found in pavement systems, and (2) that exploratory efforts be undertaken to determine the feasibility of a light, rapid return NDY system. Of great importance, (3), an extension of time-signal analysis theory is needed to cover cases of separate signal entry times and multiple phasic discontinuities.

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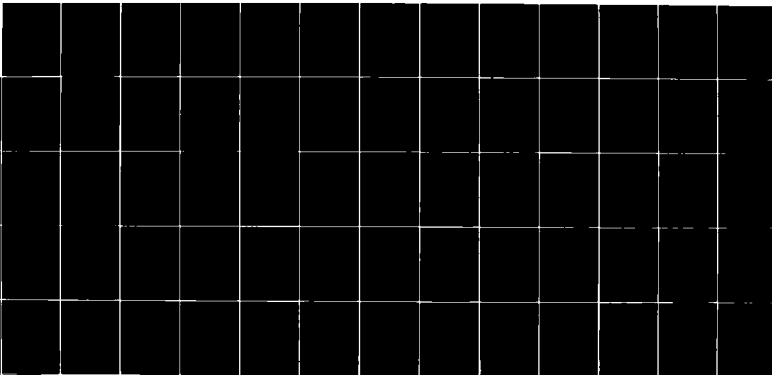
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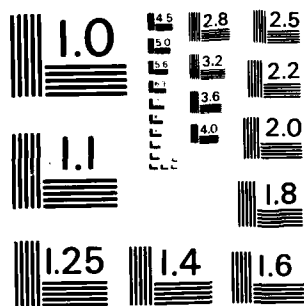
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AMIS - ACQUISITION MANAGEMENT INFORMATION SYSTEM

PROBLEMS AND PROMISES

by

Hamed Kamal Eldin

ABSTRACT

Due to the sophistication of modern military equipment, the Air Force acquisition cycle and the government contracts are complicated instruments involving large volumes of paperwork. In order to improve the contracting procedure, AFSC developed the Acquisition Management Information System (AMIS).

Like any relatively new system, AMIS has successes and failures.

The purpose of this report is to evaluate the positive and negative aspects of the system and to present recommendations for effective utilization of the system. The report also explores the future directions of AMIS and recommends short-term and long-range plans for its successful utilization.

MODELING AND TRACKING SACCADIC EYE MOVEMENTS

by

John D. Enderle

ABSTRACT

Kalman filtering theory is applied to the tracking of horizontal eye movement during a saccade. Accurate estimates of position, velocity, and acceleration of the eye movement are calculated from infra-red reflection signals off the front surface of the cornea. The mechanical components and the control signal for the ocular motor system are developed and estimated using system identification techniques. The transfer function of the open-loop ocular motor system is calculated from the fast-eye response to step target displacements. The best fit as measured by the integral of the absolute value of the error squared between the model and data is with a second order linear model with real poles describing the mechanical components and a low pass filtered pulse-step describing the control signal.

DYNAMIC RESPONSE OF DOUBLY CURVED
CYLINDRICAL SHELTER

by

Fernando E. Fagundo, Jr.

ABSTRACT

The United States Air Force is studying the feasibility of developing a protective structure for large aircraft such as the E-3A. The magnitude of the spans that must be considered in addition to the possible weapons effects makes an arch section the only feasible structural configuration.

The static and dynamic response of a double radius arch configuration is investigated. The applicability of current design provisions for the design of aircraft shelters subjected to conventional non-nuclear weapons is studied and recommendations are made for a more rational approach to describing load histories.

It is demonstrated that simplified mathematical models are not adequate for evaluating the response of the structure under consideration. Suggestions for further research in the area of conventional weapons effects are provided.

Based on the preliminary analysis performed in this project it appears that a double radius arch section could be successfully used for a Fourth Generation Aircraft Shelter. The feasibility of the shelter for large aircraft depends on the refinement of the analysis and design procedures.

USING HARD CRITERIA TO EVALUATE LEADERSHIP AND MANAGEMENT DEVELOPMENT
CENTER CONSULTATIONS

by

Dr. Hubert S. Feild

ABSTRACT

The purpose of the present research was to examine the applicability and analysis of hard or performance-based measures for evaluating consultation activities delivered by the Leadership and Management Development Center. Interviews with key personnel and analysis of available hard criterion measures for two selected Air Force groups suggested that certain measures might be useful for evaluation purposes. Interrupted time series analysis is offered as an appropriate analytical technique for determining any impacts of behavioral consultations on such data. Suggestions for selecting, applying, and analyzing hard criterion data from an evaluation perspective are made.

AN EVALUATION OF INDICES OF CORONARY HEART DISEASE (CHD)
IN A DISEASED FREE POPULATION

by

Mack Felton, Jr.

ABSTRACT

Measurement of total serum cholesterol, high-density lipoprotein (HDL) and the ratio of total cholesterol to high-density lipoprotein (Total cholesterol/HDL) of 770 US Air Force aviators was determined seeking an improved index for predicting coronary heart disease. Measurement of all variables was expressed as percents. Each variable, total serum cholesterol, HDL, and the ratio, values were plotted in percent versus concentration (mg/dl). All the aviators used in the sample were free of any coronary heart disease. Plans were to obtain data from a diseased population, however, this information was incomplete.

An estimated cut point, determined graphically, for high-density lipoprotein (HDL) and the ratio total cholesterol/HDL was ninety percent (90%). There is an obvious question of confidence in the estimated cut point, however, data obtained from a diseased population will prove or dismiss the fit of the graphically determined cut points. The data obtained in this study support the use of the ratio, total cholesterol/HDL, as a clinical instrument for predicting coronary heart disease.

Age proved to be independent of the variables measured in this study. Use of the ratio as HDL/total cholesterol provided no measurable difference in the estimated cut point.

ELECTRON TRANSPORT CALCULATIONS USING THE
METHOD OF STREAMING RAYS

by

W. L. Filippone

ABSTRACT

The development of a new approach for solving problems of electron transport theory has been initiated. It involves using the streaming ray (SR) method to solve the Spencer-Lewis equation for the electron distribution in space, angle, and path length. The electron energy spectrum and energy deposition profile can then be determined using an appropriate stopping power formula.

Preliminary calculations have been carried out for idealized problems with energy independent cross sections and stopping powers. Several numerical methods for describing the anisotropy of the scattering process have been investigated. Those techniques that preserve the momentum transfer (rather than the total scattering cross section) appear to be most successful; however, more testing is needed.

VOLTAMMETRIC STUDIES OF THE LITHIUM/VANADIUM OXIDE
ELECTROCHEMICAL CELL

by

Dennis R. Flentge

ABSTRACT

The electrochemical system composed of a lithium metal anode, a vanadium oxide (V_6O_{13}) cathode and a lithium hexafluoroarsenate/2-methyl-tetrahydrofuran electrolyte has been examined using cyclic voltammetry. Cells were found to discharge in distinct steps and to show fair rechargeability. Cell capacities were approximately 140 Ah/kg V_6O_{13} .

INTEGRAL PRINCIPLES AS APPLIED TO ELECTROMAGNETIC PROPAGATION

by

Wilfred A. Fordon

ABSTRACT

The application of the theory of the propagation of electromagnetic energy to communication systems has been hampered when an inhomogeneous, anisotropic medium is involved. The prediction of the performance of such systems has relied traditionally on well-developed techniques such as ray-tracing and, if necessary, full-wave solutions. The resulting computational difficulties often become intractable when serious discontinuities in the medium are encountered - such as the case where communication over moderate-to-long distances at HF, (3 MHz - 30 MHz), is required.

In addition to these computational difficulties, the previously-mentioned techniques are extremely sensitive to the choice of a system of coordinates.

By reverting to fundamental energy considerations and applying variational techniques, (integral principles), an alternative approach can be developed which obviates the theoretical difficulties and may alleviate the computational problems. This approach, though well-known, has not been heavily exploited. The simple and elegant formulations that ensue should enhance the capability to interpret more precisely the physical phenomena involved, and enable more sophisticated use of the propagation medium.

SCALING LAWS FOR PARTICLE BREAKUP IN NOZZLE GENERATED SHOCKS

by

L. J. Forney

ABSTRACT

Conditions for the onset of particle breakup in normal shock waves have been investigated. Including appropriately defined particle Knudsen and Reynolds numbers into analytical expressions for the drag coefficient, a normalized particle drag behind the shock has been determined in terms of gas stagnation conditions and particle diameter for a range of gas Mach numbers $1 \leq M_1 \leq 5$. Numerical computations of the particle drag, normalized with gas stagnation pressure and particle area, indicate a peak at a gas Mach number $M_1 \sim 2.2$. The magnitude of the peak was found to decrease with increasing particle diameter and reservoir gas density.

Criteria for the onset of agglomerate breakup were defined in terms of a modified Weber number for the adhesion mechanisms due to Van der Waals forces, electrostatic attraction and adsorbed surface films. These results indicate that larger more closely packed agglomerates made up of smaller constituent particles have a greater tendency to resist breakup for a given set of gas stagnation conditions and shock Mach number.

OXYGEN-18 IMPLANTATION

IN GaAs

by

Albert J. Frasca

ABSTRACT

The role of oxygen in the GaAs lattice has been studied for over a decade. The experimental results are very dependent on the anneal temperature, dose, dopant, and implant energy. This paper is concerned with the further investigation of oxygen in GaAs. Both electrical and lattice damage measurements were made. The electrical study was done using C-V techniques and the lattice damage study was done using proton backscatter techniques. Results are given for annealed and as implanted samples.

MODELING OF ACTIVE NEUROMUSCULATURE RESPONSE
TO MECHANICAL STRESS

by

Dr. Andris Freivalds

and

Mr. Jeffrey L. Harpster

ABSTRACT

The Articulated Total Body (ATB) Model, based on rigid-body dynamics with Euler equations of motion and Lagrange type constraints, was used to predict the forces and motions experienced by air crew personnel in typical flight operations. To provide a more realistic representation of human dynamics, an active neuromusculature was added to the ATB Model via the newly developed advanced harness system. The lumped three parameter muscle model included a contractile element, a damping element and a parallel elastic element.

Two validation studies were performed. The first simulated elbow flexion with one muscle/harness system representing the biceps brachii and the brachialis. The results indicated that the force velocity effects produced the greatest changes in force, with significant force changes due to the damping element and length tension relationship and no force changes due to the parallel-elastic element. The second study simulated the whole body response to a 2-G_y lateral force utilizing trunk musculature. Although the musculature did not completely prevent the lateral deflection of the body, the response is significantly delayed compared to a control response, with the head and neck maintaining the upright posture for a longer period of time.

THE MANUFACTURING CONTROL LANGUAGE FOR ROBOTIC WORK CELLS

by

Mark A. Fugelso and Brian O. Wood

ABSTRACT

Under contract F33615-78-C-5189 within the United States Air Force ICAM program, the McDonnell Douglas Corporation has developed the Manufacturing Control Language (MCL) for use with robotic work cells. An extension of the numerical control language APT, MCL contains control words for real time decision making and vision processing. These facilities, along with several other features, make this language a versatile off-line programming tool. This paper gives a basic overview of MCL's capabilities. Suggestions for further research in this area are offered.

PARAFOVEAL VISUAL INFORMATION
PROCESSING AS A SECONDARY TASK LOAD

by

Eugene H. Galluscio

ABSTRACT

Thirteen Air Force pilots were presented with a parafoveal visuospatial task while "flying" the A-10 version of the Advanced Simulator for Pilot Training (ASPT). The subjects' primary task was to maintain optimum bank and pitch control while attempting, as a secondary task, a figure matching task in the visual periphery. The results showed a left-visual field (right-brain) advantage for the visuospatial task. The results are discussed in terms of lateralized differences in brain function and the potential application of parafoveal displays for future instrument arrays. Suggestions for further research in this area are offered.

THREE-DIMENSIONAL VISUAL INFORMATION PROCESSING WITH
BINOCULAR HELMET-MOUNTED DISPLAYS

by

Eugene H. Galluscio

ABSTRACT

The efficacy of a binocular helmet-mounted display (HMD) to provide usable stereopsis in a dynamic, simulated aerial refueling environment was examined. Twelve pilots made distance judgments from a computer image-generated (CIG) model of a KC-135 tanker in the A-10 version of the Advanced Simulator for Pilot Training (ASPT). Half of the subjects viewed the tanker with a biocular display and half viewed the tanker with a binocular display that provided the perception of depth by stereopsis. Retinal image disparity in the binocular viewing condition was provided by presenting two independent CIG displays separated 76.9 mm in perspective. The results show that pilots in the binocular condition were able to judge distance more accurately. The results are discussed in terms of the additive effect of pictorial, kinetic, and stereoscopic depth cues. Suggestions for further research in this area are offered.

Shallow Donor and Exciton Binding Energies

in Quantum Wells

by

Ronald L. Greene

ABSTRACT

We examine the theory of shallow donors and excitons trapped in quantum wells formed by sandwiching one semiconductor between layers of another with a larger band gap (e.g., GaAs between $\text{Al}_{1-x}\text{Ga}_x\text{As}$). The anisotropy of the valence bands is taken into account for the exciton. Using a variational calculation, we investigate the dependence of the ground state binding energy of the shallow donor and exciton upon the width and height of the quantum well, and compare with results obtained using an infinitely deep well. We also consider the behavior of the $n=2$ states (in the hydrogenic limit) as a function of the width of the quantum well.

NITRO ORGANIC COMPOUNDS: A SYNTHETIC STUDY

by

Keith C. Hansen

ABSTRACT

Laboratory investigations directed toward the synthesis of hexanitrotolane (HNT) and trinitrophenylacetylene (TNPA) are described. Several intermediate compounds, including hexanitrostilbene (HNS), hexanitrobibenzyl (HNBB), trinitroethylbenzene, and trinitroacetophenone, were synthesized, and attempts to convert these into the desired compound are described. All attempts were unsuccessful.

The synthesis of three nitro butenes are described. These compounds are of interest as model compounds in the study of the mechanism of the thermal decomposition of trinitrotoluene (TNT). (E)-2-nitro-2-butene was prepared by the addition of nitryl iodide (from AgNO_2 and I_2) to *cis*-2-butene followed by the elimination of HI with base. Both 1-nitro-2-methylpropene and 3-nitro-2-methylpropene were synthesized by a base catalyzed condensation of nitromethane and acetone to give a nitro alcohol, conversion of the alcohol into its acetate, and then elimination of acetic acid with base. The isomeric nitro isobutenes were separated by fractional distillation.

THE EFFECT OF CERTAIN IMAGE

DATA REDUCTION TECHNIQUES

ON EDGE QUALITY

BY

DONALD J. HEALY

ABSTRACT

The purpose of this research is to ascertain ways in which preliminary feature extracting calculations can be reduced and evaluate the effect of these reductions on pertinent feature information. Techniques are implemented which map an original intensity image into a smaller image before applying edge detecting (e.g. Kirsch) operators. The effect on edge content is quantitatively evaluated. It is shown that straightforward application of standard edge detectors to reduced images does not fully extract the edge information that is available. Suggested areas for further research include:

1. Design of edge detectors which incorporate knowledge of the image reducing technique used; and
2. Implementation of feature extracting algorithms using table look-up of pre-calculated output feature information.

EVALUATION OF GAS CHROMATOGRAPHIC METHODS FOR
DETERMINING TRACE LEVELS OF TRICHLOROETHYLENE IN WATER

by

Ervin Hindin

ABSTRACT

An evaluation is made of gas chromatographic methods for the analysis of trichloroethylene in water. It is shown that electron capture detection is more sensitive than flame ionization detection. Either method of detection requires prior sample enrichment and cleanup. Static head space and purge and trap techniques can be used for enrichment and cleanup. A gas-liquid chromatographic phase of 1% SP-1000 on Carbopack-B shows excellent partitioning characteristics for trichloroethylene in the presence of other volatile organic compounds. Based on the evaluation, sample enrichment, cleanup, and gas-liquid chromatographic systems are recommended. Aqueous trichloroethylene standards and a stock solution of trichloroethylene dissolved in methanol at 4°C showed no change in concentration for up to 20 days of storage. An automated gas chromatograph with semiautomated purge and trap sampler and microprocessor data system is recommended for use by operators with limited training.

BASIC RESEARCH ISSUES IN ELECTROMAGNETIC RAIL LAUNCHERS

WITH PLASMA DRIVEN PROJECTILES

By

Dr. Manuel A. Huerta

ABSTRACT

A one dimensional steady model of the arc plasma is extended to include time varying currents. The breech voltage-current relation for the rail gun as a circuit element is obtained. The muzzle voltage measures the resistive drop at the plasma arc. The plasma is subject to the flute instability which is analogous to the Rayleigh-Taylor instability in fluids. Recommendations for future theoretical and experimental research are given.

OPERATIONAL SAFETY REVIEW METHODOLOGY

Dr. Francis J. Jankowski, P.E.

ABSTRACT

Methods of making safety reviews of hazardous operations, with an emphasis on human factors, were reviewed. Several methods exist. A comprehensive review procedure was not found. For a human factors review of tasks, Swain's Man-Machine System Analysis (MMSA) is recommended. For human error analysis, his Technique for Human Error Rate Prediction (THERP) is good; this subject is being actively worked on by others. Safety is strongly dependent on the organization, on attitudes, and on the system in which the operation is performed. Factors important in the review of each of these areas are discussed; specific review procedures are to be developed.

A study of safety records of several countries shows a number better than that of the USA. The safer countries also have a high Quality of Life Index, suggesting that safety may be improved through selection of individuals for high risk tasks.

The biorhythm based on birthdate has been shown not valid. Biological cycles determined on other basis may provide a means of making task assignments to minimize risk of human error.

Modeling Localized Stress Fields in

Composite Laminates

by

Eric Raymond Johnson

An approximate theory is developed to analyze stress concentration and stress gradient problems in composite laminates. It includes interlaminar stresses. The theory features a global-local modeling scheme, similar to the one developed by Pagano, which results in a more tractable mathematical model for thicker laminates. The global region is modeled by classical lamination theory. In the local region the field equations are obtained from the variational method using Reissner's functional with assumed stresses.

SYNTHESIS OF ACETYLENE TERMINATED

SULFONE (ATS) CANDIDATES

by

James J. Kane

and

Brenda G. Evans

ABSTRACT

Certain acetylene terminated sulfone (ATS) systems are of interest as possible replacements for epoxy resins. The beneficial feature which the ATS systems are expected to offer is their insensitivity to moisture. Reaction schemes for their synthesis are outlined and discussed. Finally, the synthesis of certain of the intermediates required for the ATS candidates are reported and discussed and recommendations for future work in this area are presented.

MATHEMATICAL FORMULATION OF THE
SHEAR LAYER OVER AN
OPEN CAVITY

By

Samuel G. Kelly, III

ABSTRACT

The problem of shear layer oscillations over an open cavity is investigated including the effects of shear layer thickness. The Navier-Stokes equations are used to derive governing equations for the unsteady pressure distributions in the cavity, the shear layer, and the external flow. Boundary conditions are written for these equations with a discussion of the boundary condition at the trailing edge included. The problem results in a set of partial differential equations with boundary conditions applied over an oscillating boundary. Possible solution techniques are discussed as well as suggestions for future work.

AUTOMATING THE NUMERICAL STEREO CAMERA

by

Dennis M. Kern

ABSTRACT

A Numerical Stereo Camera (NSC) has been set up in the lab. The image acquisition portion of the NSC has been automated and takes approximately 4 seconds. Several sets of points have been collected using different objects. This data has been checked for reasonableness, but a complete evaluation of the output remains to be done.

MEMORY AND PROCESSING LIMITS IN DECISION MAKING

by

Stuart T. Klapp

ABSTRACT

The demands of command and control decision making seem to approach and often exceed the limits of human information processing. A literature review indicated that much of the potentially relevant research may not generalize from the laboratory to decision making. However, transfer appropriate learning and a multiple store view of short-term memory and resource limits are ideas worth exploring from the standpoint of decision making. A model task was developed to permit efficient study of these and other issues within a decision making context. This task, involving trucking and transportation, appears to be suitable for use with a large subject population because it involves only general knowledge. Several optional auxiliary features were built into the model task in order to address specific research issues. Experiments are suggested which address principles raised by the literature review and other relevant issues.

ANALYSIS AND MODELING OF A REAL-TIME HOLOGRAPHY SYSTEM

by

Jerome Knopp

and

Jeffrey M. Swindle

ABSTRACT

The real-time holography system was studied in some detail using a generic model. It is shown that aberrations are introduced by wavelength rescaling. Further errors are generated by the very nature of phase recording a hologram plus the non-linearities in the recording media. Resolution requirements and MTF limitations show that present day phase recording devices are just barely adequate to correct low level turbulence.

A study of the system using dimensional analysis showed that the Fresnel approximation may be used to construct a scale model based on Arkadiew's Law.

NUMERICAL SOLUTION OF
THE THREE-DIMENSIONAL, UNSTEADY
EULER EQUATION

by

Keith Koenig

ABSTRACT

The three-dimensional, unsteady Euler equations provide a reasonably general description of inviscid, rotational flow, but are simpler to solve than the Navier-Stokes equations. A computer program, originally developed at AEDC, which solves the general Euler equations for flow past three-dimensional bodies has been implemented on the Eglin AFB, CYBER 176 computer. A document has been produced which discusses in detail this computer program, the fluid mechanics of the problem, and the numerical techniques involved in the solution to the equations. This document serves two purposes: to introduce the principles of computational fluid dynamics to engineers and scientists unfamiliar with this subject, and to provide detailed instructions on the use of this particular computer solution of the Euler equations.

DISPLAYING RESULTS FROM NUMERICAL CALCULATIONS
USING COMPUTER GRAPHICS

by

Letitia Korbly

ABSTRACT

Exploration of specifications for a data base to link results from numerical solutions of partial differential equations with graphics programs which display this information. More generally, two and three dimensional functions defined at a finite number of points are to be graphed so that important features of these functions are easily and accurately grasped.

In preparation, a program linking the output of a two dimensional fluid dynamics calculation with R. W. Conley's Raytrace was written. Refractive index, opacity and color were used to show the differences in density between different nodes in the calculation.

The study indicates that simply using a standard data base will not solve the problems connected with linking three dimensional digital data with graphics programs. Optical properties must be chosen to highlight functional values. Color and opacity are the easiest qualities to interpret.

Normalization is crucial to effective display. Normalization matches the range of the data to the range of the display so the data fits the display range.

While using refractive index to display density offers the possibility of evaluating the analyses directly at some time, it is presently only confusing.

Suggestions are made for further research.

MODIFICATION OF CURRENT FEEDBACK STRATEGIES:
A TEXT SYNTHESIS APPROACH

By

Dr. Philip Langer

ABSTRACT

Training with respect to maintenance of sophisticated weaponry is becoming an increasingly more complex Air Force problem. Curriculum sequencing and content seems likely to be little impacted by recent findings in cognitive psychology, and hence feedback becomes an increasingly more significant adjunct aid to instruction. The behaviorist position views feedback as an incentive, assuming learning consists of a strengthening or weakening of stimulus-response associations. The cognitive position argues the critical impact of feedback is one of information, and assumes that the organization and utilization of content is dependent on individual strategies. The behaviorist model appears adequate for hierarchial or fixed sequence content, while the cognitive position appears more tenable for problem solving and higher order learning. This project proposes the exploration of the parameters of the feedback mechanism from a cognitive viewpoint, utilizing a text synthesis method. Through analyses of learner outcomes, including errors, a model may be developed which will permit matching of the most appropriate feedback strategy to the learner's cognitive processing. In effect, feedback will be "titrated" as to amount and frequency based on the learner's response.

THE DETECTION OF HAZARDOUS MATERIALS FROM SPILLS

by

Stephen F. Lin

ABSTRACT

This report discusses the instrumentation for detection and identification of hazardous materials. Both remote sensing instruments and non-remote portable instruments have potential application in emergency operations. The remote sensing techniques are reviewed as to their principles and their applications in air pollution measurements. Commercially available semi-portable, portable, and personal instruments are surveyed, and the principles of operation are briefly discussed. The instruments that are being developed for hypergol vapor detection are specifically used.

TENTATIVE IDENTIFICATION AWARENESS STAGES LEADING TO FAILURE OF VIGILANCE

by

Michael L. Lobb

ABSTRACT

Vigilance, or more specifically sustained attention, has been studied by various electrophysiological and behavioral methods. Electrophysiological measures, typically EEG, are equivocal indices of sustained attention, whereas the behavioral measure of the missed signal is convincing. A measure of sustained attention more reliable than EEG is clearly needed. In the present paper, electrooculographic (EOG) measures are taken along with simultaneous video taping of EOG, EEG, and actual eye movements during a temporal auditory discrimination task. The computer record of these measures is then analyzed for sequences of eye movements and EEG which fall into discernable patterns.

The results suffice to tentatively identify at least five substages of sustained attention: (1) involuntary blinks, (2) voluntary long closing duration blinks, (3) long closure duration with SEM precursors, (4) long closure durations with alpha and half-wave SEM, and (5) long closure durations with full wave SEM and alpha fading during the closure. These substages appear in episodes and roughly describe the progression from sustained attention to missed signals. In addition to these substages saccadic reorientation eye movement(s) may follow the termination of a substage 4 or 5 occurrence. These findings, although tentative, may offer a reliable means of measuring the central state of sustained attention. Furthermore, transitions within and between episodes of sustained attention do not follow an all or none law, but rather are progressive and orderly.

ORDER RELEASE IN AN MRP ENVIRONMENT

by

Deborah J. Medeiros

ABSTRACT

To date work in Manufacturing Resource Planning (MRP II) has concentrated on the development of order release and due dates based on fixed lead times, a master production schedule, and a capacity plan. This paper discusses an extension of the order release procedure which controls work in process inventory through staged release of batches of orders to the factory floor. The composition of each batch of orders varies depending on queue lengths at key operations. The objective of the procedure is to reduce overall flowtime.

The procedure uses a macro level simulation model to assess the effects of changing the order release times. The simulation is written in IDEF₂, a dynamics modeling methodology developed for the ICAM Program. The use of IDEF₂ in this environment is discussed. Suggestions for extension of the research are provided.

THE MEASUREMENT OF ION-MOLECULE REACTION RATE COEFFICIENTS

by

Thomas M. Miller and Rodney E. Wetterskog

ABSTRACT

Rate coefficients have been measured for C^+ , CO^+ , and CO_2^+ reactions with O_2 over a temperature range of 90-450 K using a selected-ion flow-tube (SIFT) apparatus at the Air Force Geophysics Laboratory. Charge transfer is observed to take place for $CO^+ + O_2$ and $CO_2^+ + O_2$, but is not allowed energetically for $C^+ + O_2$. Instead, we observe $C^+ + O_2 \rightarrow O^+ + CO$ and $C^+ + O_2 \rightarrow CO^+ + O$ occurring. The $C^+ + O_2$ reaction is found to proceed at its gas kinetic rate of about $9 \times 10^{-10} \text{ cm}^3/\text{s}$, independent of temperature for 90-450 K. The rate coefficients for both the $CO^+ + O_2$ and $CO_2^+ + O_2$ reactions are decreasing functions of temperature in this range. The ion flow velocity in the SIFT apparatus has been determined versus gas pressure and temperature using a time-of-flight technique. These results, combined with our helium flow measurements, have significant implications for low-temperature reaction experiments with flow-tube reactors.

A GaAs FET Computer Model With
Applications to Magnetic Field Effects

by

Michael J. Moloney

ABSTRACT

A computer model of a GaAs FET has been constructed. It uses explicit charges on the electrodes, and real-time development of the charge distribution to steady state. It shows interesting and realistic I-V relations. Its magnetoresistance results are preliminary but mimic literature results in part. A somewhat novel magnetic field measurement for FET's is proposed. If this effect is large enough to use, the computer model should be very helpful in its interpretation.

FLUTTER TAMING BY NONLINEAR ACTIVE CONTROL

by
Luigi Morino

ABSTRACT

A new concept for the design of aeroservoelastic systems is introduced: flutter taming by nonlinear active control, i.e., use of nonlinear active control to ensure that the behavior of the system beyond the flutter speed is of benign rather than destructive nature. It is shown that flutter taming is always possible for an aeroservoelastic system that can be represented by a system of nonlinear differential equations (with algebraic nonlinearities). This is accomplished by using a very simple nonlinear control law. It is important to emphasize that the active control system for flutter taming is fully nonlinear, and therefore it does not affect the linear behavior (in particular the stability characteristics) of the system. Hence, flutter taming can be used in conjunction with flutter suppression by active control (i.e., use of linear active control to increase the flutter speed).

A THEORY OF PHOTOLUMINESCENCE FOR EXCITONS BOUND TO
TWO TYPES OF NEUTRAL ACCEPTORS IN SILICON-
A STUDY OF THE SYSTEMS Si: (In, Al) AND Si: (In, B)

by

David S. Moroi

ABSTRACT

In the absence of saturation, the rate equations for the densities of free excitons and excitons bound to two types of neutral acceptors in silicon are solved for steady state. The rate equations contain the terms for the transfer (tunneling) of an exciton bound to one type of neutral impurity to another and its reverse transfer. The steady state solutions of the rate equations yield an expression for the ratio of the bound exciton luminescence intensities as a function of the impurity concentrations. The rate of transfer for a bound exciton is calculated using the standard treatment in quantum mechanics with the help of a hydrogenic model wavefunction for an exciton bound to a neutral acceptor. This model exciton-neutral-acceptor complex consists of two relatively massive holes attracted to the negative acceptor center forming a core and a single relatively light electron repelled by the negative acceptor center. The bound exciton transfer rate is expressed in terms of some forty two exponential integrals, more than one half of which can be obtained using the recurrence relations among the basic two-center integrals. The transfer rate is also calculated using the WKB approximation in quantum mechanics which resulted the same distance-dependent major factor.

ERROR ANALYSIS OF THE KARHUNEN-LOEVE TRANSFORM
IN VCG SIGNAL PROCESSING

ABSTRACT

BY

H. Troy Nagle, Jr.

The report summarizes the progress made in analyzing the U.S. Air Force automated VCG processing system. The work was performed during July and August, 1982.

SIMULATION OF ADAPTIVE NETWORKS BASED ON
REST PRINCIPLE AND HETEROSTATIC MODELS

by

Eugene M. Norris

ABSTRACT

The objective of the work reported on here is the establishment of a preliminary estimate of the relative capabilities of networks of adaptive components in the performance of closed-loop learning tasks. A simulation test bed was written in 1966 FORTRAN and a scheme for uniformly describing adaptation algorithms based on recent work of Sinclair and of Klopff was devised. Results of a one-dimensional landmark learning experiment are discussed. It is discovered that the relation between an adaptive network and its environment is subtle and that much work is likely needed before a workable set of design criteria for networks and environments can be developed. The effects of introducing inhibition are likewise in need of further study.

AIRCRAFT ELECTRIC POWER GENERATION USING CASCADED
SYMMETRICALLY WOUND MACHINES

by

Thomas H. Ortmeier

Brushless variable speed constant frequency electric power generation may be obtained using cascaded symmetrically wound machines. The feasibility of using these machines as the basis for a stand-alone aircraft generator system is investigated. The concept is attractive as the system operates without hydraulics and employs a solid state power converter which operates at a fraction of the system output power and frequency. Additionally, the converter has some degree of isolation from the load. These factors combine to offer a system of relatively low complexity with the potential for high reliability operation.

The operating characteristics of the two machines are examined. It is shown that, with proper choice of poles of the machines and with power factor correction of the generator load, the power handling requirements of the system can be minimized, at reasonable levels. Voltage and frequency control of the machines appears to be attainable without resorting to sensing internal machine variables. These results support a conclusion that the cascaded machines form the basis of a viable generator system. Recommendations for additional research on the system are included in this report.

ADAPTATION TO OPTICAL FLOW RATES
DURING LOW ALTITUDE, HIGH SPEED FLIGHT

by

Dean H. Owen

ABSTRACT

Research with a driving simulator demonstrated that drivers adapt to high rates of speed, increasing actual speed in order to hold apparent speed constant. Adaptation affected sensitivity to subsequent change in speed and the aftereffect persisted for up to 20 sec. If adaptation is to optical flow rate rather than speed per se, pilots can compensate for adaptation in two ways: (1) by increasing speed and/or (2) by losing altitude. Two preliminary experiments were conducted using the Advanced Simulator for Pilot Training to determine first whether pilots adapt to optical flow during low altitude, high speed flight. If it is shown pilots do adapt, further research will test for effects on sensitivity to changes in altitude and speed. Embedded within the adaptation period was a second experiment on sensitivity to lateral displacement. Time to initiate a rudder-pedal adjustment will be related to fractional increase in displacements simulating 90-deg crosswinds.

THE ROBUSTNESS OF UNIDIMENSIONAL ITEM RESPONSE THEORY MODELS

by

Charles K. Parsons

ABSTRACT

No set of test data will perfectly fit an item response theory (IRT) model. Test unidimensionality is frequently assumed, yet strict adherence is unlikely in any test. This study examines violations of this assumption and shows that meaningful interpretations can be made when the test deviates from unidimensionality. By varying the degree of correlation among factors, the number of factors, and the distribution of major factor loadings, it was found that more highly correlated factors, more factors, and balanced factor loadings improve the fit of the unidimensional model. Applications to test development and validity are offered.

R-RELIABLE INTERVALS FOR THE SUM OF TWO INDEPENDENT
NORMAL OR UNIFORM RANDOM VARIABLES

by

S. A. Patil

ABSTRACT

An R-reliable interval and its associated confidence level $C(R)$ for the sum of two independent random variables is defined. The implications for this confidence level if the additional assumption is added that the summands are normal are explored. This is done for R-reliable intervals based on sample ranges. Also, an R-reliable interval based on the sample variances is investigated, and its confidence level $C(R)$ is tabulated for selected sample sizes and ratios of the standard deviations. It is shown that when the sample sizes of the summand variables are greater than two, the confidence level for an R-reliable interval for the sum is greater than the minimum of the confidences for the corresponding R-reliable intervals for the summand variables. Furthermore, an R-reliable interval and its confidence for the sum of two independent uniform random variables is obtained, and the non-decreasing confidence conjecture of Locasso⁵ for the R-reliable interval for that sum is proved also.

MODEL REDUCTION OF CONTROL SYSTEMS

L. R. PUJARA

ABSTRACT

In this report a computer-aided method of model reduction of single-input/single-output control systems is presented. The simplification is carried out by minimizing a weighted mean square error between the frequency responses of the given and the reduced systems. A numerical example related to the aircraft pitch rate/pilot input of the AFTI/F-16 aircraft is simplified using the proposed technique, and the results are compared with those obtained by the McFit technique.

MEASUREMENT OF LEVELS OF PROSTAGLANDIN-E
AND PROSTAGLANDIN-F_{2α} IN VARIOUS TISSUES, URINE, AND PLASMA
OF RATS GIVEN NONADECAFLUORODECANOIC ACID

by

Zahir Qureshi

ABSTRACT

The effect of 50 mg/kg nonadecafluorodecanoic acid on the levels of prostaglandin-E₂ and prostaglandin-F_{2α} in heart, kidney, liver, urine, and plasma of rats was investigated. Control rats were given 2 ml/kg propylene glycol/water (1:1) solvent. Difficulties in the initial extraction procedure were encountered and, as a result of several discussions with prostaglandin researchers, the extraction procedure was modified. The prostaglandin-E and F_{2α} levels were measured using modified (³H) prostaglandin radioimmunoassay kits. In the final assay, standard curves could not be drawn due to unreliable counts per minute. A wide variation in the counts per minute for samples of the same tissue is also seen suggesting weaknesses in the technique or malfunction in the scintillation counter. Comparisons between counts per minute for treated and control groups are made but no conclusion is reached. Recommendations are made for further study.

A PRELIMINARY STUDY OF ELECTROMIGRATION
IN ALUMINUM AND ALUMINUM-SILICON FILMS

by

R. L. REMKE & K. T. WILSON

ABSTRACT

Accelerated tests were developed and the experimental apparatus constructed to study the electromigration of aluminum and aluminum-silicon thin films. The accelerated tests were developed to investigate the effect of hydrogen ambient, temperature cycling, and a pulsed current with a direct current bias on electromigration. To perform these tests, a special test chamber was constructed to provide a controlled ambient at elevated temperatures and still allow the electromigration to be monitored by measuring the conductor resistance. Film annealing and step stressing procedures were begun on the thin film aluminum conductors to measure the thermal coefficient of resistance and to estimate the electromigration activation energy. Recommendations for continuing the research are offered.

A STUDY OF FACTORS AFFECTING

SOOT FORMATION IN A

SWIRL - STABILIZED COMBUSTOR

by

Richard W. Rice

ABSTRACT

The effects of a variety of combustion and sampling variables on soot concentration and particle size distribution were studied using a swirl-stabilized laboratory combustor and an Electrical Aerosol Analyzer (EAA). Tests were conducted over a range of reference velocities (2.5 to 10 m/s) and equivalence ratios (0.05 to 0.3) for five gaseous fuels: propane, n-butane, ethylene, propylene, and 1-butene. Soot concentration and size were found to decrease with increases in either gas reference velocity or, surprisingly, equivalence ratio. Alkenes produced more and larger soot particles than alkanes of corresponding carbon number. Sooting tendency increased with increased carbon chain length. Probe placement and sample line length affected soot concentration measurements. Smoke number readings were obtained for comparison with EAA data.

Recommendations were made for further work on the topics lightly surveyed in this study and for extensions which could possibly answer important questions raised here concerning soot growth/oxidation phenomena.

DEVELOPMENT OF A MATHEMATICAL FOUNDATION

FOR CELLULAR IMAGE PROCESSING

by

Gerhard X Ritter

ABSTRACT

Recent increases in image processing and pattern recognition activities have resulted in a proliferation of notation and basic operations for describing image processing algorithms that are often identical. A rigorous mathematical structure for aiding in the design, development, optimization and testing of image processing and image classification algorithms is, therefore, highly desirable. This study develops an initial foundation of such a structure for cellular image processing based on the interaction between algebra and topology. Specifically, we show that image dilations, erosions and other types of cellular logic operations can be expressed entirely in the topological language of limit points, and open and closed sets. The novel concept presented is the creation and use of cellular topological spaces. Endowing cellular sets with a topology provides a vehicle for transforming image manipulations to the standard mathematical terminology used in topology. Because of this, it now seems possible to provide a standardized mathematical formulation for all geometric image processing concepts. As examples, we provide some neighborhood operations for filtering, data compression, and image matching. Some of these are novel while others date back to Minkowski's development of the geometry of numbers in 1897.

TURBULENT BOUNDARY LAYERS OVER ROUGH

SURFACES IN HYPERSONIC FLOW

by

John M. Russell

ABSTRACT

A practical method based on earlier contributions by Van Driest for predicting the downstream development of the skin friction, heat transfer, and momentum thickness is derived and discussed. The most obvious method for incorporating roughness effects based on a straightforward generalization of a well-known method developed in low speed flows is criticized for its lack of consideration of radiated Mach waves. A linear theory for the supersonic flow of an inviscid shear layer over a wavy wall is presented and discussed as an idealized model for steady Mach wave radiation (and its effect on skin friction) from stationary obstacles.

CONCEPTUALIZATION OF THE DYNAMIC BEHAVIOR OF THE FLOW-FIELD IN
THE APL COMBUSTOR

by

Sarwan S. Sandhu

ABSTRACT

Results of a brief investigation of the dynamic behavior of a bluff-body stabilized diffusion flame are presented for air and fuel flow rates of 1kg/s and 6kg/hr, respectively. A cine film, acquired at 4000 frames/s, of the reacting flow field near the bluff-body was analyzed with regard to time variant interaction between the annulus air stream and the flame stabilizing recirculation zone. Air vortices generated from the shear layer of the air stream appear to interact with the recirculating zone while growing as they move downstream. Estimated air vortex average axial and rotational velocities are 22.8 m/s and 548.9 rad/s, respectively. Estimated peripheral average angular velocity of reactive fluid recirculating zone is 506.5 rad/s. Fluid, made visible by dispersed reacting and emitting relatively "small" sized gaseous pockets, appears to move upstream in a core about the centerline towards the recirculating spatial region. Reacting fluid, made visible by light emission, appears to be peeled off the recirculating reactive zone in the form of cylindrical shells with irregular boundaries at quasi-periodic intervals. Ratio of air vortex to flame turbulence frequency at an axial dimensionless location of 0.68 is about 2/1.

PERFORMANCE DEMAND AND CNS DEPRESSANT STRESSOR EFFECTS
ON SPATIAL ORIENTATION INFORMATION PROCESSING

by

Robert E. Schlegel

ABSTRACT

An evaluation of spatial orientation information processing was performed using the Manikin Task. The specific objectives of the study were to measure the speed vs. accuracy tradeoff characteristics of the task and to assess performance on the task under the influence of ethyl alcohol.

Five male subjects were extensively trained in the performance of the task. Following training, the subjects performed the task at various presentation rates (workload demand) and under baseline vs. alcohol conditions (CNS depressant). Preliminary data analysis revealed that the task is in fact sensitive to both workload demand and the presence of alcohol. The speed-accuracy tradeoff function shifts in the direction of both decreasing speed and decreasing accuracy. Recommended extensions of the research in terms of further data analysis and examination of additional research questions are provided.

METAL ORGANIC CHEMICAL VAPOR DEPOSITION-EVALUATION
OF CURRENT AND POSSIBLE FUTURE CHEMICAL SYSTEMS
AS RELATED TO THE FORMATION OF GALLIUM ARSENIDE

by

Eugene P. Schram

ABSTRACT

Current chemical systems utilized for the formation of gallium arsenide, via MOCVD, have been compared. The highest quality product has apparently resulted from the employment of gallium triethyl and arsine. However, care must be exercised in comparing different chemical systems because the purity of all reactants is critical to the production of high mobility GaAs.

Potential new molecular sources for gallium are suggested, as related to MOCVD, and include: $\text{GaH}_3 \cdot \text{N}(\text{CH}_3)_3$, $\text{GaH}_3 \cdot \text{NH}_3$, and several polyfluoroalkyl derivatives of gallium.

SOFTWARE SIMULATION REQUIREMENTS FOR THE
CVA PROGRAM AND OTHER APPLICATIONS

K. Sam Shanmugan

ABSTRACT

The DVAL joint test force methodology for CVA requires a considerable amount of pre-test and post-test analysis of receiver performance under a variety of jamming environments. The complexity of the receivers and the jamming environments preclude the use of a purely mathematical approach for receiver performance analysis. A combination of mathematical methods along with Monte-carlo type simulation of the receiver and the link will lead to a fast and accurate method of pre-test and post-test analysis. This report outlines a simulation approach and the of simulation software requirements for the CVA program.

While the CVA program is used as one example where simulation can play a significant role, a general purpose communication systems simulation software package can be used in a variety of applications within RADC.

AFTERBURNING SUPPRESSION KINETICS
IN ROCKET EXHAUST

by
Trilochan Singh

ABSTRACT

Two computer codes have been used to study the suppression of afterburning phenomena during the summer of 1982. PLFLAME code (which solves a set of equations governing a premixed laminar flow) was used to simulate the temperature and species profiles for a fuel rich H_2 -Air flame. The results of PLFLAME code show that the addition of candidate suppressants (K, HBr) lower the peak flame temperatures. The steady state atomic hydrogen mole fraction decreases as the percentage of K increases. The trend is reversed with the increase in HBr mole fraction.

Boat code was used to simulate the mixing and chemical processes that taken place as the exhaust jet mixes with outside stream. The results of BOAT code show that the addition of K to the unburnt stream delays the onset of ignition at some radial locations depending upon the chemical composition of the jet.

Additional runs are required to identify the kinetic mechanisms responsible for the phenomenon and design an experiment to verify the results of the simulation.

ON ESTIMATING PROBABILITY OF KILL

IN WEAPON EVALUATION

by

B. D. Sivazlian

ABSTRACT

The problem of estimating the mean and standard deviation of the probability of kill when evaluating weapons in the presence of uncertainty in the input parameters is investigated. Kill produced by either weapon blast or weapon fragmentation is studied. Three different methods for carrying on the estimation procedure are analyzed. Method 1 relies on the assumption that the input parameters are uniformly distributed over given ranges. Method 2 assumes that the probability of kill function can be expanded as a Taylor's series in terms of the input parameter. A third method, closely related to Method 2, is also presented. The two situations when aiming error is absent and when aiming error is present are considered. Closed form expressions are provided whenever possible and suggestions for further research are offered.

METHODS FOR COMPUTATION OF CERTAIN DIAGNOSTICS

FOR THE AFGL GENERAL CIRCULATION MODEL

by

Stanley L. Spiegel

ABSTRACT

Computer programs have been developed to permit the calculation of kinetic and potential energy, and enstrophy for the atmospheric motion fields associated with the primitive equation spectral general circulation model under development at the Air Force Geophysics Laboratory. These calculations can be performed in either of the two physical space coordinate systems relevant for assessing model performance. Results of these calculations, and similar computations being carried out in the model's spectral domain, will be helpful in understanding and improving the functioning of the model.

A DIFFERENTIAL GEOMETRIC APPROACH TO ELECTROMAGNETIC LENS DESIGN

By

Alexander P. Stone

ABSTRACT

A lens design technique developed by Carl E. Baum for transitioning TEM waves, ideally with no reflection or distortion, between cylindrical and conical transmission lines is investigated. This method uses a differential geometric approach combined with Maxwell's equations and the constitutive parameters ϵ and μ in an orthogonal curvilinear coordinate system. Isotropic but inhomogeneous media are considered. It is shown that rotational coordinate systems obtained from complex analytic transformations in the plane may be utilized in the design, and that a class of solutions to the design problem exists. This class of solutions is based on a Riccati type of differential equation. Suggestions for follow up research in this area are made.

THE USE OF EXPERIMENTAL INPUT
IN TRANSONIC AERODYNAMICS

by

Alfred G. Striz

ABSTRACT

A brief description of various two-dimensional and three-dimensional steady and unsteady transonic codes is given which are evaluated for possible implementation on the Eglin AFB computer system. A modification is presented to the two-dimensional small-disturbance transonic code STRANS2 to accept experimental pressure distributions as input. This will generate a semi-empirical output to be used as input to the harmonic-analysis unsteady transonic code UTRANS2. The aerodynamic coefficients thus obtained can be used in a strip-theory-type analysis of three-dimensional wings. Also, the unsteady linear transonic Kernel function program ANKF is being evaluated by comparison to experimental results obtained at NLR. This code utilizes experimental steady Mach number distributions and mode shapes as input. For a subsonic case, the code shows good comparison. Only limited comparison is obtained for a transonic case. Finally, a short description is given of the contents of a seminar on Fundamentals of Aeroelasticity which was conducted at AFATL/DLJCS.

A DYNAMIC MODEL OF ACCELERATION STRESS PROTECTION
IN THE HUMAN AIRCREW MEMBER

by

Patrick J. Sweeney, Ph.D., P.E.

Mary Doddy, M.S.

ABSTRACT

This dynamic simulation computer model demonstrates the affects of G-forces upon the eyeball pressure of the aircrew member in various G-force environments. The stress relieving affects of G-suits and aircrew straining (M-1 and L-1 maneuvers) are dramatically depicted. The changes in the straining maneuver programs are evident in eyeball pressure and energy drain on the aircrew members. Further research in this area will undoubtedly result in improved aircrew performance in high and varying G-force environments.

COLLISION-INDUCED ABSORPTION IN THE FAR

INFRARED SPECTRUM OF N₂

by

Richard H. Tipping

ABSTRACT

The far infrared absorption arising from collision-induced transitions in gaseous N₂ has been investigated. After a review of the procedure for the theoretical calculation of the translation-rotational spectrum, new results for a temperature of 200K are reported. Similar calculations for other temperatures appropriate to the Earth's atmosphere will enable one to model the absorption by N₂ for arbitrary paths through the stratosphere. The collision-induced absorption mechanism becomes important only for paths above the tropopause, where the absorption by allowed water transitions and by the corresponding water vapor continuum absorption that dominate far infrared spectra near the Earth's surface are small.

PHOTOIONIZATION OF IODINE MOLECULES AND CLUSTERS
IN A SUPERSONIC MOLECULAR BEAM

by

Edward A. Walters

and

J. Kent Newman

ABSTRACT

In preparation for a study of the photoionization of I_2 , I_3 , I_4 , etc. a photoionization mass spectrometer employing a supersonic molecular beam emerging from a small nozzle was relocated from Los Alamos National Laboratory. Much of the effort described here has to do with moving and critical alignment of the mass spectrometer. Also described are the results of a literature survey of the photoionization and photoelectron spectroscopy literature on the important iodine molecules and clusters. Design of a nozzle for the generation of I_3 is discussed. Work done in interfacing a PDP 11/23 computer to the mass spectrometer and initial results of software development for controlling the experiments are described.

DATA COMMUNICATIONS BETWEEN
CDC CYBER 750 AND HP 1000

by

Kai Wang

ABSTRACT

There are many different computers in use today. Each has its own relative strength and preferred peripherals. Establishing communications between two (or more) different computers can combine the best features of each machine to form a system with much more power and flexibility than a stand-alone computer can provide.

In our project, we have established data communication between CDC CYBER 750 and HP 1000 computers. We have developed a pair of programs which consists of a PASCAL program for the HP 1000 and a FORTRAN program for the CYBER 750. For downloading, the programs must be running concurrently to provide the necessary cooperation. Suggestions for further extending this system are offered.

ISOLATION OF PYROGENIC EXOTOXIN C FROM
STAPHYLOCOCCUS AUREUS STRAINS ASSOCIATED WITH TOXIC-SHOCK SYNDROME

by

Edward R. Ward, Jr.

ABSTRACT

The development of a reproducible and clinically useful technique for the isolation and identification of pyrogenic exotoxin C (PEC) from isolates of Staphylococcus aureus is investigated. Results show that isoelectric focusing of extracellular proteins for one hour and subsequent staining of gels with silver stain to be the method most sensitive and reproducible. The methods used by the Centers for Disease Control (Dr. James Feeley, personal communication) and Schleivert et. al., (1981) were modified to increase sensitivity in detecting small amounts of PEC.

In addition, four isolates of S. aureus from different anatomic sites of the same individual with clinically diagnosed toxic-shock syndrome were examined with this technique. Of the four isolates (urine X2, throat, and cervix) only the cervical isolate showed PEC when compared to the positive controls.

EFFECT OF NDFDA ON FATTY ACID SYNTHESIS IN RAT LIVER

by

Thomas E. Webb

ABSTRACT

The question of the biochemical basis for the extreme hepatotoxicity of NDFDA (nondecafluorodecanoic acid) has been investigated from the point of view of its effects on stearyl CoA desaturase and associated electron transport functions in the microsome fraction. Changes in this parameter would be consistent with perturbations observed earlier in the fatty acid content of liver and of membranes of cells exposed to this compound. These preliminary studies indicate that hepatic stearyl-CoA desaturase activity drops in both NDFDA-treated animals and in the pair-fed controls, approaching zero within 6-8 days. This drop is attributed mainly to decreased food intake and since it occurred also in the controls, does not appear to be related to NDFDA hepatotoxicity. However, NDFDA induced several biochemical changes not present in the pair-fed controls. These include (1) decreased inducibility of stearyl-CoA desaturase by force feeding an amino acid/sucrose mixture, (2) a marked decrease in the rate of microsomal electron transport from NADH through cytochrome b₅ to the terminal oxidases (including the desaturase) and to molecular oxygen and (3) an increase in the concentration of cytochrome P-450, an important component of the microsomal drug metabolizing system. NDFDA caused only a small decrease in the content of microsomal cytochrome b₅. Insulin levels appeared normal in the treated animals. The unique effects of NDFDA on one of the main target organs appears to reflect direct or indirect modulation of genetic expression and/or specific changes in membrane systems rather than non-specific cellular damage.

HOOK INTERFEROMETRY USING A PULSED DYE LASER

by

David Weimer

ABSTRACT

The question of whether a Michelson interferometer can be used instead of a Mach-Zehnder interferometer for spectral interferogram hook measurements with a one meter grating spectrograph has been investigated. Using a pulsed He discharge and a nitrogen pumped dye laser, hooks have been measured and the population density determined. The results appear to be consistent with published data. Suggestions for further research in this area are offered.

LASER DAMAGE IN FILMS AND PLASTICS

by

T. A. Wiggins

Abstract

Methods and techniques for a study of laser damage thresholds in thin films and plastics were investigated. To observe damage at $1.3\mu\text{m}$, the conversion of the $1.06\mu\text{m}$ output of a Nd:Glass laser to the $1.3\mu\text{m}$ wavelength by stimulated Raman scattering in NO was attempted. No output at $1.3\mu\text{m}$ was detected probably due to the excessive line width of the laser. Techniques for the study of damage in plastics at $1.06\mu\text{m}$ was prosecuted using a Nd:YAG laser. Commercially available types of clear plastics were tested including Lexan, Acrylic, and Uvex. A supposedly optical grade plastic was also tested. The highest damage threshold was found in Acrylic at $5 \times 10^9 \text{ watts/cm}^2$. The damage in this and the other plastics appear to be due to cracks and burns at random positions in the laser beam showing small ($<10 \mu\text{m}$) defects to be the initiators of damage. A technique for producing multiple damage tests from a single beam was tested. Suggestions for continued work are included.

AN ALGORITHM AND ASSOCIATED DATA STRUCTURES
FOR HIDDEN SURFACE ELIMINATION

by

David H. Williams

ABSTRACT

A hidden surface algorithm is presented that uses a modified span coherence algorithm. The algorithm is structured such that simple processing is performed during the early stages so that the data is reduced during the later stages when more detailed processing is required. The hidden surface problem is addressed in an integral manner in which clipping, and the removal of backfacing surfaces are considered to be part of the hidden surface processing. The data structures are chosen to allow efficient processing at each stage, and to be modular so that new object attributes can be easily added. Linked lists are employed where dynamic memory allocation is required, and arrays or linked lists of arrays are employed where random access is important.

EFFORT TO PRODUCE METABORIC ACID VAPOR AND WATER VAPOR

BROADENING OF CARBON MONOXIDE ABSORPTION LINES

by

Robert E. Willis

ABSTRACT

Effort was made to produce HBO_2 in the gaseous phase by heating H_3BO_3 to over 1000 K in a vacuum. Attempts at detection were made with a Fourier transform infrared spectrometer. Based on what is known of its structure, a detailed prediction was made of the spectrum in the band centered at 2030 cm^{-1} .

The broadening by water vapor of the P(2), P(3), and P(7) lines of the fundamental vibrational transition of carbon monoxide was studied with a tunable diode laser infrared spectrometer at seven temperatures ranging from 400-1000 K. For each data point the collisional halfwidth was determined by fitting the line shape to a Voigt profile. The halfwidths were then fitted to $\gamma_L = \gamma_L^* (T_0/T)^n$.

3-DIMENSIONAL GRID GENERATION WITH APPLICATIONS
TO HIGH PERFORMANCE AIRCRAFT

by

David C. Wilson

ABSTRACT

A general method of constructing 3-dimensional grids is developed using straight forward techniques from Trigonometry and Analytic Geometry. The method has the virtue that explicit, yet simple, formulas are used. This procedure allows tight control of grid point location and mesh size. These ideas are then applied to the special case of a high performance aircraft with close-coupled canard.

Time Domain Analysis and Synthesis of Robust
Controllers for Large Scale LQG Regulators

by

Rama Krishna Yedavalli

Abstract

The aspect of 'Robustness' in the analysis and synthesis of time domain large scale Linear Quadratic Gaussian (LQG) regulators is addressed. Both 'Stability Robustness' and 'Performance Robustness' are combinedly considered to meet stability and performance requirements. The perturbations which cause instability in the system are viewed as consisting of two types of modeling errors: namely parameter variations and model/controller truncation. Conditions are derived for 'Stability Robustness' in terms of the singular values of the closed loop system matrix and the perturbation matrix for various cases of perturbations. Simple measures of 'Stability Robustness' and 'Performance Robustness' are derived and based on these measures, a control design algorithm is presented that achieves a satisfactory trade-off between stability and performance. Applications in the field of Large Space Structure (LSS) Control are discussed. Suggestions for further research are offered.

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